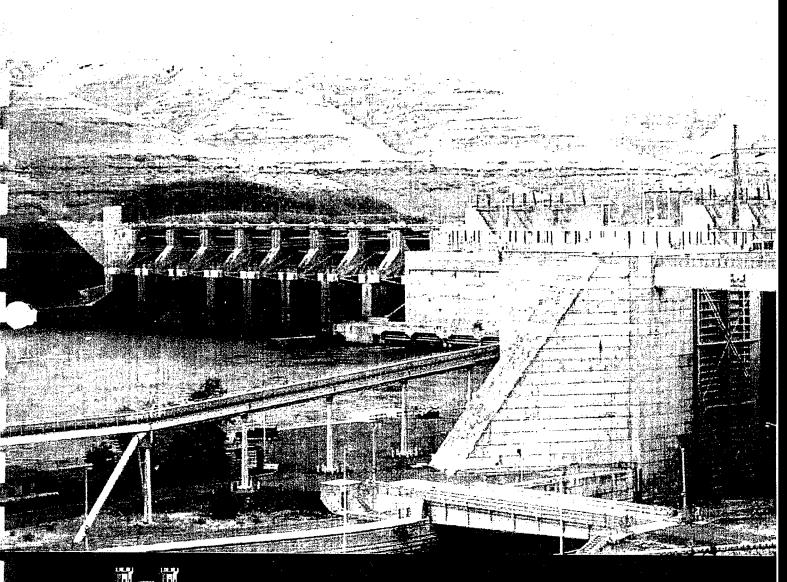
February 2001

# Little Goose Dan Radial Gate Inspection and Testin





US Army Corps of Engineers, Walla Walla District











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## **Contents**

INTRODUCTION	1 <sup>V</sup>
Purpose	1 v
Scope of Investigation	. 1 ~
Limitations	1 //
Limitations	1
PROJECT BACKGROUND	2 °
Project Description	
Gate Design and Construction	
Gate Operation	
Inspection	5
UCHCIAI	
Procedures	6 °
Member Designations	91
General Inspection Observations	9 🗸
Radial Gate – Operation, Testing and Measurements	22 ′
Individual Gate Inspection Observations	25 🗸
Hoists – Operation, Testing and Measurements	31 🗸
RECOMMENDATIONS	35√
DEFEDENCES	36 V

#### **APPENDICES**

- A Gate Inspection Sheets v
- B Hoist Inspection Sheets C Inspection Photographs D As-built Drawings

# LITTLE GOOSE DAM RADIAL GATE INSPECTION AND TESTING

## INTRODUCTION

## **Purpose**

The Corps of Engineers, Walla Walla District, requires a comprehensive evaluation of the radial gates at Little Goose Dam. The District retained HDR Engineering, Inc. to perform inspection and testing of the radial gates through Task Order No. 5 under Contract DACW68-00-D-0001. The task order scope of work includes review of project information, an initial meeting and inspection, comprehensive field inspection of the radial gates, testing of gate hoist machinery, recording trunnion movement, and preparation of a report.

## Scope of Investigation

The scope of this investigation includes:

- Review of design, construction, maintenance and operations information provided by the District.
- Hands-on visual inspection of accessible upstream and downstream portions of eight radial gates.
- Visual inspection of the hoists and hoist equipment.
- Testing of gates and hoists while operating.
- Recording trunnion movements while raising gates in both loaded and unloaded condition.
- A report including documentation of the design and operation of the gates and hoists, inspection and testing results, conclusions, and recommendations.

## Limitations

The services under this contract include the professional opinion and judgment on the data and information reviewed. The conclusions and recommendations presented in this report are based on the information provided by the District and the inspection of the radial gates and hoists. The inspection was visual only and only accessible portions of the components were inspected. No nondestructive tests or laboratory testing was conducted in the course of the inspection.

## PROJECT BACKGROUND

## **Project Description**

Little Goose Dam is located in southeastern Washington on the Snake River, 28.7 river miles upstream of Lower Monumental Dam, and 70.3 miles above its confluence with the Columbia River.

The main project structures include a powerhouse, concrete spillway, navigation lock, fish facilities, concrete non-overflow sections, and a rockfill embankment on the north shore. The dam is 2,655 feet long including the embankment. Construction of the project began in June 1963 and was completed in January 1970.

The spillway is 512-feet-long and is located about mid-river. The spillway consists of eight radial gate controlled bays separated by 14-feet-wide piers. The radial gates are each 50-feet wide by 60-feet high. The gates are numbered 1 to 8 from left to right looking downstream. The spillway structure has a maximum height of 204.4 feet with the deck at Elev. 651.0. The spillway crest is at Elev. 581.0 and the top of gates at Elev. 640.0. The reservoir stores 565,000 acre-feet at normal full pool (Elev. 638.0).

The Spillway Design Flood (SDF) is 850,000 cfs. The spillway has a design capacity of 850,000 cfs at reservoir level Elev. 646.5. The maximum spillway capacity at normal full pool (Elev. 638.0) is 676,000 cfs. At Little Goose Lock and Dam for the period from 1951 to 2000 the maximum flood of record was 306,700 cfs on June 18<sup>th</sup>, 1974. Peak flow outside the period of record is 409,000 cfs on June 5<sup>th</sup> 1894. This value was computed from flood marks by the U.S. Weather Bureau.

## **Gate Design and Construction**

The Corps of Engineers designed the gates and project facilities. The gates were fabricated by Pacific Car and Foundry of Seattle, Washington.

The Walla Walla District provided copies of the engineering drawings and shop drawings for the gates. The gate and hoist specifications were also provided as well as design calculations for the gates. The following information was obtained from these documents.

The 3/8-inch to 1/2-inch thick skin plate is supported by vertical ST10WF31 purlins. The skin plate is 3/4-inch thick on each end of the gate to act as a wear surface for the lifting cables. The purlins are connected to three horizontal plate girders. Each horizontal girder is supported by 14WF gate arms. The gate arms are braced with 14 WF members and there are ST7WF15 braces between the downstream flanges of the horizontal girders. The gate end frames were assembled in

2

the field. The skin plate was installed in five vertical sections and joined by full penetration welds.

Cable attachment brackets are mounted on the skin plate at the bottom corners. The skin plate, purlins, horizontal girders and cable attachment brackets are A441 high strength / low alloy steel (Carbon - Magnesium - Vanadium, Heat Treated for Pressure Vessels). All other members are A-36 steel.

Each trunnion has a 24-inch diameter forged steel pin with a cast aluminum bronze bushing. The trunnion pin was designed to limit the bearing pressure to 4 ksi based on the reaction from the gate of 3,005 kips.

The trunnions rest on a concrete girder that is anchored to the spillway piers with two groups of 48 - 1-1/4 inch diameter prestressed bars. The trunnion girder and anchor bars were designed for two loading conditions: balanced and unbalanced. In the balanced condition with two adjacent gates closed, the total load on each group of anchor bars is 3,040 kips. When one gate is unloaded, the load on the anchor bars increases to 4,180 kips. The bars were designed for 0.6 of ultimate and a total prestress force of 5,122 kips.

The gates are raised and lowered by electric hoist units mounted on the deck above the gates. Eight, 1-inch diameter wire ropes on each side of the gate wind on separate drums mounted on a common shaft. The hoist operating speed is approximately 1.16 feet per minute.

The gates have rubber J-bulb side seals and rubber wedge bottom seals. The side seal plates and sill beams are heated to prevent ice formation. The heating system consists of piping embedded below the seal plates through which electrically heated oil is circulated. The seal heaters are manually started and thermostatically controlled when the air temperature drops to 32 degrees F. There are also air bubblers at three elevations on each pier for ice and debris clearing. They are manually operated from the service gallery.

A trunnion friction coefficient of 0.3 was used to design the yoke anchorage but there is no indication that trunnion friction was considered in the design of the gate arms.

## **Gate Operation**

The gates may be operated by manual control from stations located near each hoist, but normally the gates are remotely controlled from the powerhouse. All of the hoists can be powered from a diesel generator set.

The spillway is operated to pass the desired discharge with the best hydraulic conditions in the stilling basin. The gates are opened in one-foot increments during the fish passage season from March 1 through December 31 according to the operating sequence in Table 1.

3

Gate Number / Gate Stops						Total	Spill		
1	2	3	4	5	6	7	8	Stops	(kcfs) <sup>1</sup>
1	0	0	0	0	0	0	1	2	. 4
1	1	0	0	0	0	1	1	4	8
1	1	1	0	0	1	1	1	6	11
1	1	1	1	1	1	1	1	8	15
1	1	2	1	1	2	1	1	10	19
1	1	2	2	2	2	1	2	13	25
2	1	2	2	2	2	1	2	14	27
2	2	2	2	2	2	2	2	16	31
3	2	2	2	2	2	2	2	17	33
3	2	3	3	2	2	2	3	20	39
3	3	3	3	2	3	2	3	22	43
3	3	3	3	2	3	3	4	24	47
3	3	3	4	3	3	3	4	26	52
4	3	4	4	3	3	3	4	28	56
4	4	4	4	3	3	4	4	30	60
5	5	4	4	3	3	4	4	32	64
5	5	.5	4	4	3	4	4	34	68
5	5	5	4	4	4	4	5	36	72
5	6	5	5	4	4	4	5	38	76
5	6	5	5	4	4	5	6	40	80
6	6	5	5	4	5	5	6	42	84
6	6	5	5	5	5	6	6	44	88
7	6	5	5	5	5	6	7	46	92
7	6	5	6	6	5	6	7	48	96
_ 7	6	6	6	6	6	6	7	50	100
_ 7	6	6	7	7	6	6	7	52	104
7	7	6	7	7	7	6	7	54	108
7	7	7	7	7	7	7	7	56	112
8	7	7	7	7	7	7	8	58	116
8	7	8	7	8	7	7	8	60	120
8	7	8	8	8	8	7	8	62	124
8	8	8	8	8	8	8	8	64	128
9	8	8	8	8	8	8	9	66	132
9	8	9	8	9	8	8	9	68	136
Q	8	9	۱ ۵	9	9	l g	9	70	140

Table 1 - Gate Operating Sequence

(1) Forebay El. 638

#### **Gate Maintenance**

The District performs routinely inspects, tests, and lubricates the gates and hoists. Recent significant maintenance activities consist of:

- Gate1 In August 1981, placed stoplogs and repaired hoist cable grooves in face plate with Belzona. Gate was sandblasted and painted. Also repaired hoist cable anchors by welding with stainless steel wire. Two 2-inch-diameter by 24-inch-long anodes were installed adjacent to each anchor block. These repairs were inspected in October 1987 and found to be in good condition.
- Gate 5 Took gate out of service in June 1980 and inspected cables and anchors. Sandblasted damaged areas, repaired by welding, and painted with vinyl system. Inspected repairs in February 1988. South side of gate had severe corrosion under one wire rope with pits up to ¼ inch deep.
- Gate 8 In September 1982 placed stops and repaired cable anchors by welding. Installed magnesium anodes adjacent to each block. Repaired corrosion under the cable with Devcon "A". Sandblasted and painted gate with standard vinyl system. Inspected in May 1992 and found that the repairs were in good condition. The anodes appeared to be preventing corrosion under the wire ropes. The south side shows more corrosion and the wear plates have small pinholes over the full length. The worst corrosion is occurring where the side seals connect to the gate face. The bolts are stainless steel. The center portion of the gate is showing pinhole corrosion.
- In 1983 all gates were reconditioned and repainted under contract DACW68-83-C-0111.

## Inspection

#### General

Wayne Edwards and Mike Haynes of HDR Engineering performed an initial site visit and inspection on April 5, 2000. Based on information collected during the initial inspection, HDR prepared an inspection plan and inspection sheets that were submitted to the District for review prior to the detailed inspection.

The inspection and testing of the spillway radial gates was performed from October 2nd through 9th, by Sam Planck, P.E., Heather Yee and Tony Barela, of HDR Engineering, Inc. Steve Schmidlkofer and Jim Knowles of K&N Electric inspected the hoists, took amperage measurements, and recorded observations during testing. Gary Struthers Associates were responsible for operation of the gates during the loaded and unloaded testing and moved the stoplogs between gate testing. Emerald Services, Inc., as a sub-contractor to Gary Struthers, provided water blast cleaning of the skin plate during the upstream face inspection. The weather was clear with temperatures ranging from 50 to 75 degrees F for the inspection of Gates 2

5

through 8. The upstream inspection of Gate 1 was performed in rainy conditions and a temperature of 40 to 50 degrees. Due to the wet and unsafe conditions, the racking measurements, inspection of the bottom of the upstream face and the trunnion dial gage measurements were not performed. Sam Planck, P.E. Amy Akins and Marv Brammer, P.E. of HDR returned to the site on November 20<sup>th</sup> to complete the inspections for Gate 1. The reservoir was full during all of the inspections.

#### **Procedures**

## **Upstream Inspection & Testing**

For the upstream inspections, stoplogs were placed in front of the gates prior to the inspection. The upstream face of Gates 1 through 8 were inspected from the spillway deck as each gate was raised to the full open position. The first part of the inspection was a rope access inspection of the bottom seal, bottom of the upstream surface of the skin plate and the hoist connections. At certain gates, the inspection under the bottom of the gate could not be made due to excessive leakage through the stoplogs, see Photo. 1. Racking measurements between the bottom seal and the spillway were also made at this time.

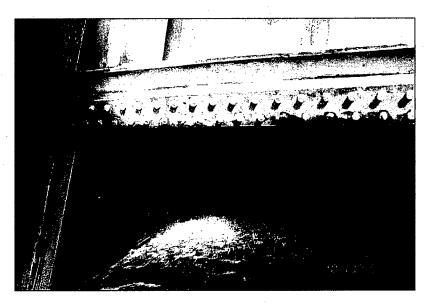


Photo. 1: Heavy leakage from stoplogs preventing inspection of bottom upstream face of Gate 3.

The second part of the upstream inspection consisted of the transverse, operational measurements at the trunnion, amperage readings while opening and closing the gate, and the inspection of the upstream surface of the skin plate. Measurements were made to determine transverse movement of the trunnion hub versus the trunnion yoke at the initial, full open, and final closed position. During the gate opening, visible corrosion, debris and surface inconsistencies were waterblasted from the gate face for better condition assessment, see Photo 2. Amperage readings for the hoist were recorded at initial opening, during opening and during closing.

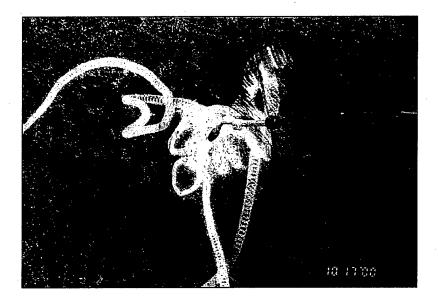


Photo. 2:
Waterblasting
of upstream
surface of skin
plate during
full opening of
gate.

## **Downstream Inspection**

The downstream portions of all gates were inspected by climbing along the horizontal girders and radial struts, see Photo. 3. Inspection rigging for the downstream inspections was anchored to the gate hoist equipment and torque tubes. Visual observations were made for excessive sweep and camber of the main struts and were recorded only if an abnormal condition was observed.

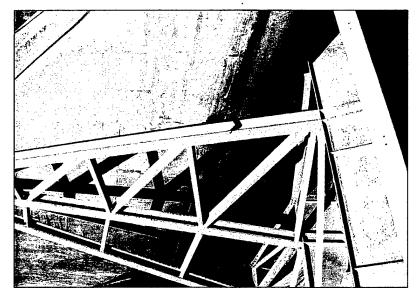


Photo. 3: Rope access downstream inspection.

## Operational Testing – Unloaded vs. Loaded

At the completion of the upstream inspection, with the stoplogs in place and the gate unloaded, dial gages were set at the trunnion to measure the vertical and lateral movement of the trunnion hub versus the trunnion yoke. Steel rulers were used to measure the transverse movement of the trunnion hub versus the trunnion yoke. After initial readings were taken, the top stoplog was cracked open and the void was flooded, loading the gate. When the void between the stoplogs and the gate was completely full, final movement readings were taken. There was no gap present at the bearing between the trunnion yoke and the trunnion support beam, therefore, movement readings between the two surfaces were not made.

## Operational Testing – Loaded

With the stoplogs removed and the gate fully loaded, the gates were opened to two feet. Amperage reading for the hoists were recorded at the initial opening, during the opening of the gate and during closing.

#### **Ultrasonic Testing**

Non-destructive, ultrasonic testing was not performed at Little Goose Dam. At Lower Granite Dam the locations of field weld splices were indicated on the plans and were ultrasonically tested during the inspection. There were no indications of field weld splices in primary members on the design or shop plans for Little Goose Dam and none were found in the field.

#### **Nomenclature**

The gates are identified as Gate 1 to 8, with 1 on the south end near the powerhouse looking downstream. Unless noted otherwise, all locations of observations, and notes pertaining to the radial gates are identified as right or left <u>looking downstream</u>.

In the inspection sheets and this report, corrosion is classified as light, moderate or heavy as follows:

- Light Surface rust with no flaking or packing. Rust can not be scraped off by hand.
- Moderate Some flaking, beginning to pack, but thickness of the pack is less than approximately 1/16". There is no observable loss of section.
- Heavy Pack rust with measurable or observable section loss to the member.

## **Member Designations**

For the radial gate inspection observations and the photographs, the member designations indicated in Figure 1 apply.

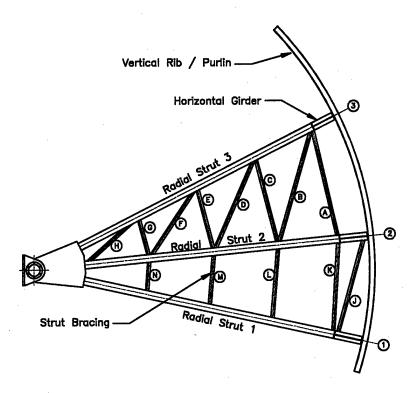


Figure 1: Radial gate member designations.

## **General Inspection Observations**

The majority of condition observations found during the inspection are consistently found at all of the gates. The following section of the report pertains to those general observations or conditions which were found to apply to all of the gates. Specific observations or deficiencies for individual gates begin on page 25. No significant deviations from the as-built plans were observed for the radial gates. Field inspection sheets for the gates are included in Appendix A. Hoist operation and inspection sheets can be found in Appendix B.

## **Upstream Surface of Skin Plate**

The condition of the upstream surface of the skin plate varies from generally good to extremely poor depending on the gate and the locations on the skin plate. On average, the pits are approximately one inch in diameter and 1/4-inch to 5/16-inch deep. Some appear to be greater than 1/4-inch deep in the 3/8-inch thick portion of the skin plate and greater than 3/8-inch deep in

the 1/2-inch thick portion. See Figure 2, and photos 4 and 5. There is moderate to heavy, scattered pitting on the 3/4-inch wear plates on most of the gates. There is pitting present in excess of 1/2-inch deep at some locations, see Photo. 6. At many locations the pitting on both the skin plate and wear plates appears to be associated with scratches or dings in the plates original protective coating, see Photo. 5 and Photo 7. Based on the hemispherical shape of the pitting, the corrosion appears to be microbially influenced. It is likely that increased acid levels due to microbial activity have created a concentration cell within the pits and accelerated the corrosion.

There is significant delamination of the vinyl coating on the wear plate at Gates 2 and 6 with smaller spots of delamination at other gates. See Photo. 8.

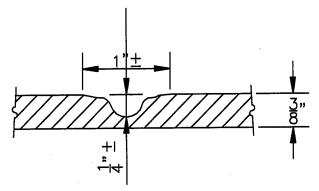


Figure 2: Typical pitting profile in 3/8 inch plate.

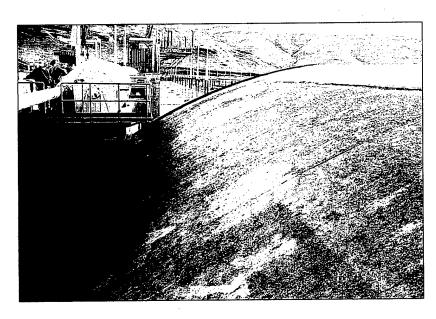


Photo. 4: Typical, generally good condition of skin plate.

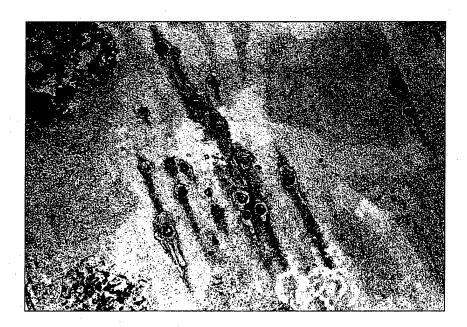


Photo. 5: Skin plate pitting, typical.

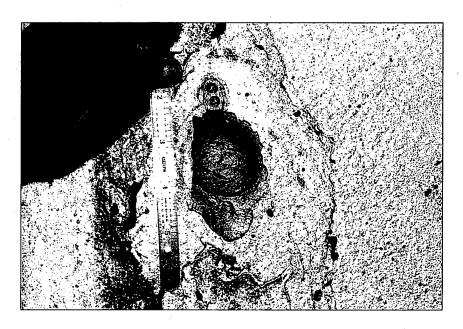


Photo. 6: Wear plate pitting - heavy, typical. Hemispherical shape is indication of microbially influenced corrosion.

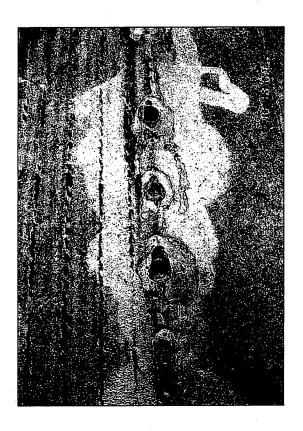


Photo. 7: Pitting on wear plate. Pitting appears to be associated with scratches in coating, typical.



Photo. 8: Delamination of vinyl coating on wear plate, typical Gates 2 and 6.

#### **Hoists Connections**

The hoist connections are in generally good condition with light to moderate corrosion present on the lifting lug plates. The U-bolts, socket blocks and connection pin, which appear to be stainless steel, are in very good condition, see Photo. 9. The design or material type for the U-bolts, socket blocks and connection pin are not listed in the available plans. The sacrificial anodes appear to be in too good of a condition given their installation date of 1981 and 1982. It is likely that they were painted or in some way protected after their installation and ceased functioning as anodes.



Photo. 9: Hoist connection, typical condition.

#### Downstream Surface of Skin Plate

The downstream surface of the skin plate is in generally good condition. Isolated spots of light to moderate surface corrosion and previous (painted over) pitting can be found at various locations. There is also evidence of previous weld and grind repairs made to some gates indicating earlier penetration of the skin plate by corrosion. The weld and grind repairs are in good condition and show no signs of further corrosion from the downstream side. See Individual Gate Inspection Observations on Page 25 for locations and photographs of weld repairs.

13 02/01/01

#### **Vertical Purlins**

The vertical purlins are in generally good condition. At the bottom of the gate there is standing water between the bottom seal closure plate, the web of the purlins and the downstream side of the skin plate. Light to moderate corrosion is forming on all surfaces. There is no drainage for this space and it is consistently full of water and debris at all gates, see Figure 3 and Photo. 10.

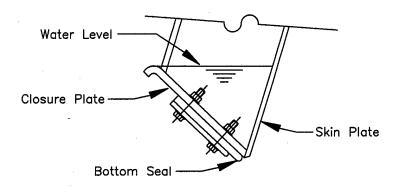


Figure 3: Standing water at bottom of gate between skin plate, purlin webs and bottom seal closure plate, typical.

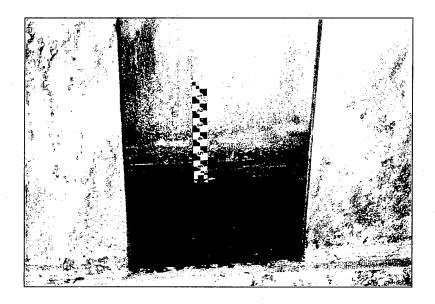


Photo. 10: Standing water at bottom of gate between skin plate, purlin webs and bottom seal closure plate, typical.

#### Horizontal Girders and Braces

The horizontal girders and bracing are in generally good condition. There are isolated spots of light to moderate corrosion, mostly at locations with poor drainage.

The top and middle horizontal girders are divided into twelve drainage areas due to the web stiffeners. The area at either end of the girders is free to drain off the end of the web. The remaining ten areas have only three drain holes and require water to flow horizontally through at least one notch in the stiffeners in order to reach a drain hole. There are debris lines and evidence of standing water on nearly all of the horizontal girder flanges and webs.

The worst corrosion occurs on the bottom horizontal girder, between the multiple stiffeners, at each end of the girder. There are six stiffeners in close proximity to one another with drainage only provided horizontally through a notch at the upstream (low) end of the stiffener. In order for the last space to drain, the water must travel horizontally under five stiffeners. These notches are typically clogged and the area between the stiffeners is consistently full of water and debris, see Photo. 11.

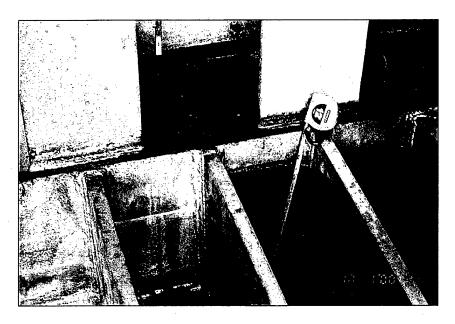


Photo. 11: Standing water between stiffeners at ends of bottom horizontal girder, typical.

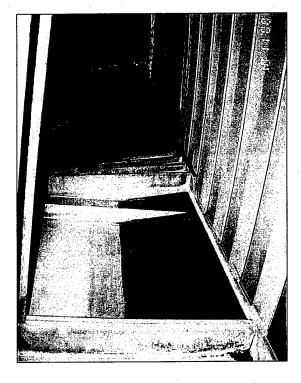


Photo. 12: Standing water or debris lines between stiffeners at ends of bottom horizontal girder, typical.

Immediately upstream and slightly above the end of the bottom horizontal girders, there are stiffeners between the skin plate, purlins and upstream flange of the horizontal girders. There is no drainage from this location and the enclosed area is either full of water and/or debris on all gates. See Photo. 13.

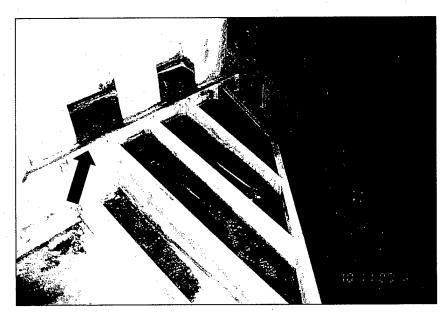


Photo. 13: Standing water and debris between purlins, skin plate and upstream horizontal girder flange, typical.

On the underside of the bottom horizontal girder, at the connection to the radial struts, there is delaminated paint and light to moderate corrosion around the drain hole in the girder web and near the adjacent stiffeners. See Photo. 14.

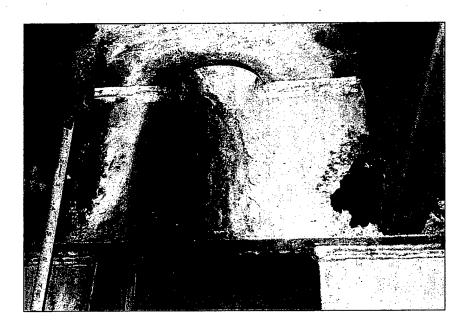


Photo. 14: Corrosion beneath bottom horizontal girder. Looking up at girder flange and drain hole. Stiffener at right, typical.

#### Radial Struts and Braces

The radial struts are in generally good condition with only light surface corrosion at isolated locations, see Photo 15.

There is very poor drainage from the upstream end of the bottom radial strut and ponding or debris lines (evidence of previous ponding) are found at every gate.

There is very poor drainage from the downstream end of the top radial strut at the trunnion. The three radial struts become an enclosed box section at the trunnion. Since there is no drainage vertically from between the flanges of the top strut, a small drain hole is provided horizontally through the strut flange. The drain hole is consistently clogged and standing water is present at most trunnions. See Photo. 16.



Photo. 15: Light surface corrosion on radial struts and braces, typical.

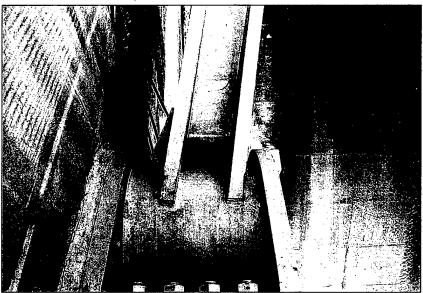


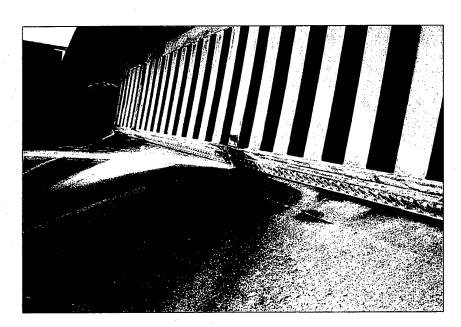
Photo. 16: Standing water at downstream end of top radial strut at trunnion hub, typical.

#### **Trunnions**

The trunnion hubs, yokes and bearing material are in generally very good condition and appear well lubricated. Lubricant was observed being expelled between the yoke and hub, around the circumference of all of the trunnions.

#### Side and Bottom Seals

The side and bottom seals are in generally good condition. Small side and bottom seal leaks are visible on many of the gates, although no major leaks were observed. There is a leak at the bottom seal, at the spillway monolith construction joint at nearly every gate, see Photo. 17. There is light to moderate corrosion on the downstream side of the skin plate at the side seals and side seal bolts, see Photo 19.



19

Photo. 17: Leak at spillway monolith construction joint, typical.

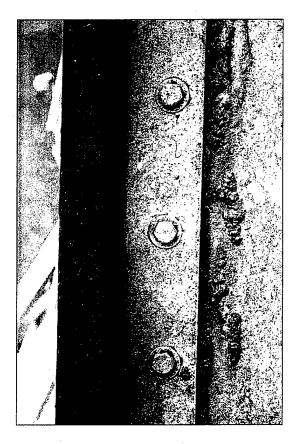


Photo. 19: Side seal from upstream side with no signs of cracking or deterioration, typical condition.



Photo. 18: Side seal from downstream side, light to moderate corrosion on skin plate, seal angles, nuts and bolts, typical condition.

There is moderate corrosion on the skin plate on the upstream side of the bottom seal. The downstream side of the bottom seal is in good condition with little occurrence of corrosion. See Photo. 20 and Photo. 21. The rubber seals are in good condition with only hairline cracking visible.

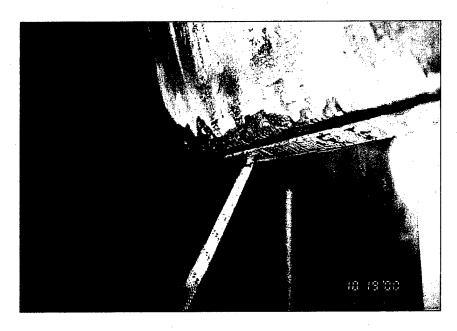


Photo. 20: Upstream side of bottom seal with light to moderate corrosion on skin plate, typical.

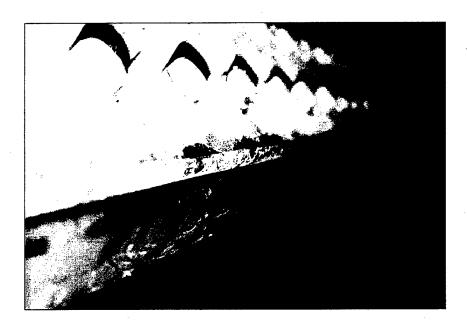


Photo. 21: Downstream side of bottom seal, typical

## Radial Gate – Operation, Testing and Measurements Member Section Dimensions

Section dimensions of main structural members were measured to verify conformance with the design drawings. These members included radial struts, radial strut bracing, horizontal girders, horizontal girder bracing and purlins. Measured dimensions were recorded on field data sheets found in Appendix A. The data sheets also contain nominal section dimensions from the American Institute of Steel Construction (AISC) Steel Construction Manual, Seventh Edition, 1970. Section measurements typically include the depth, d (measured at the edges of the flanges), the flange width, b<sub>f</sub>, and the flange thickness, t<sub>f</sub>. Web thickness, t<sub>w</sub>, was only measured if there was an exposed portion of the web or drain holes large enough for calipers.

Differences between the design drawings and the actual field conditions of 1/16<sup>th</sup> inch or less were deemed to be insignificant. Nearly all members in the field were found to be greater or equal in dimension than what was required in the design drawings. The larger dimensions were probably due to inaccuracies of the field measurements resulting from difficult access or with the thickness of the paint on the members. Those that were smaller were all within the fabrication tolerances. Of those measurements that were out of fabrication tolerance range, none were consistently out of range to conclude that a member other than what was specified in the design drawings was used.

## **Racking Measurements**

Racking measurements for the gates were made at the beginning of the upstream inspection of the gates. Measurements were recorded for the distance between the bottom of the gate at the bottom corner of the bottom seal plate, and the embedded spillway sill plate. Measurements were made as far as possible to the left and right side of the gate depending on stoplog leakage and flow on the spillway. The gates were typically between two and four feet open when the measurements were made. The measurements for racking are as follows:

	Left (inches)	Right (inches)			
Gate 1	39 – 1/2	39 – 1/2			
Gate 2	39 – 1/2	39 – 1/2			
Gate 3	42	42			
Gate 4	Too much stople	Too much stoplog leakage to measure			
Gate 5	39 – 1/4	39			
Gate 6	41	41			
Gate 7	38 – 1/2	39			
Gate 8	45	45			

Table 1: Gate racking measurements.

The gates were also observed at the moment of first opening to look for signs of water release beginning from one side of the gate or the other. In most cases, water release would begin at both sides of the gate simultaneously and move towards the middle of the gate at equal rates. Based on the recorded measurements and observations, there is no apparent racking of the gates.

## Trunnion Hub Movement: Closed - Full Open - Closed

With the stoplogs in place, measurements were made of the transverse gap between the trunnion hub and the trunnion yoke, at both sides of the trunnion, at both trunnions. The measurements were made with the gate at the initial opening, full open, and again when closed. The maximum transverse movement recorded between any two positions is as follows:

	Left T	runnion	Right Trunnion		
	Inside (inches)	Pier Side (inches)	Inside (inches)	Pier Side (inches)	
Gate 1	1/32	1/32	0	0	
Gate 2	0	1/32	0	1/32	
Gate 3	0	0	0	0	
Gate 4	0	1/32	0	1/32	
Gate 5	1/32	1/32	0	0	
Gate 6	0	0	1/32	1/32	
Gate 7	1/32	2/32	1/32	1/32	
Gate 8	1/32	2/32	1/32	0	

Table 2: Transverse trunnion hub movement through full opening and closing

Based on the surface irregularities of the trunnion hub and the casting tolerances, the transverse measurements between the hub and the yoke can only be considered accurate to  $\pm 1/16$ -inch. The recorded measurements indicate there is no appreciable lateral movement of the trunnion hubs with respect to the trunnion yoke during either opening or closing of the gate.

#### Trunnion Hub Movement: Unloaded vs. Loaded

Dial gages were installed at both trunnion to record the vertical, transverse and upstream / downstream movement of the trunnion hub with respect to the trunnion yoke. The initial measurement was made with the stoplogs in place and no load on the gate. The final reading was made after the top stoplog was removed and the gate was fully loaded. The maximum movements recorded at the trunnion hubs are as follows:

	Vertical	Upstream / Downstream	Transverse
·	(1 / 1000 inch)	(1/1000 inch)	(1/1000 inch)
Gate 1	7	34	0 .
Gate 2	4	22	0
Gate 3	12	31	31
Gate 4	8	32	0
Gate 5	10	31	31
Gate 6	0	45	0
Gate 7	11	37	31
Gate 8	1	30	0

Table 3: Loaded versus unloaded trunnion movements

For the vertical movements shown in Table 4, the hub moved upward with respect to the yoke during loading. The upstream / downstream movement of the hub was in the downstream direction and the transverse movement was outward, toward the piers.

The design tolerance for the 24-inch diameter trunnion pin is listed in the plans as +0.000 inches and -0.005 inches. The tolerances for the 24-inch diameter trunnion bushing is listed as +0.012 inches and -0.000 inches. The shop plans for the pin indicate the pin should be 23.98 inches in diameter with tolerances of +0.000 inches and -0.008 inches.

Based on the recorded movements and the tolerances, there is no significant displacements of the trunnion hub with respect to the trunnion yoke occurring during the loading process.

24

## Individual Gate Inspection Observations

The observations in the following section pertain only to the gates indicated and were not typically found on all of the gates.

#### Gate 1

There is an apparent weld and grind repair on the downstream side on the skin plate at approximately 5 feet above the middle horizontal girder near the left side of the gate.

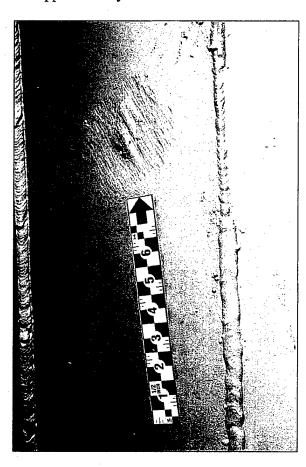


Photo. 22: Apparent previous weld and grind repair as seen from downstream side of skin plate on Gate 1.

#### Gate 2

• On the downstream side of the skin plate, along the wear plate, there is delamination of the vinyl coating on the plate. Large sheets of vinyl are peeling off of the wear plate and hanging loosely on the gate face.



Photo. 23: Delaminated vinyl coating on wear plate, right side of Gate 2.

#### Gate 3

• See General Inspection Observations

## Gate 4

There is a large deformation in the web of the top horizontal girder at the left end.

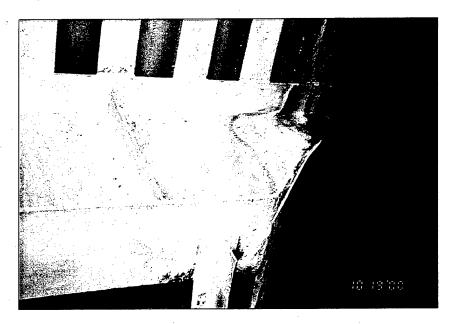


Photo. 24: Deformation in web of top horizontal girder.

#### Gate 5

There is a line of light to moderate corrosion on the downstream side of the skin plate just above the top horizontal girder approximately 10 feet from the left side of the gate.



Photo. 25: Moderate corrosion on downstream surface of skin plate.



Photo. 26: Moderate
surface
corrosion on
downstream
surface of skin
plate.

#### Gate 6

• On the downstream side of the skin plate at approximately half way between the middle and top horizontal girder, twelve feet from the left side, there is an apparent weld and grind repair from a previous leak. The plug weld is approximately ½-inch in diameter.



Photo. 27: Apparent, previous weld and grind repair on downstream surface of skin plate.

• On the downstream side of the skin plate, along the wear plate, there is delamination of the vinyl coating on the plate. Large sheets of vinyl are peeling off of the wear plate and hanging loosely on the gate face.



Photo. 28: Delaminated vinyl coating on wear plate, left side of Gate 6.

## Gate 7

See General Inspection Observations

## Gate 8

See General Inspection Observations

## Hoists – Operation, Testing and Measurements Hoist Operation Inspection

External portions of the hoist equipment, support platforms and gate connections were visually inspected for signs of excessive corrosion, wear or damage. The hoist and hoist machinery are in generally good condition, however, excessive motor and bearing noises were observed at many of the hoists. See Photos 30, 31 and 32.

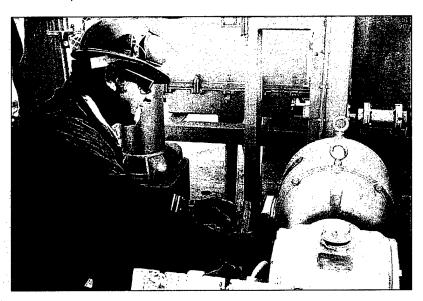


Photo. 29: Recording hoist amperage readings.

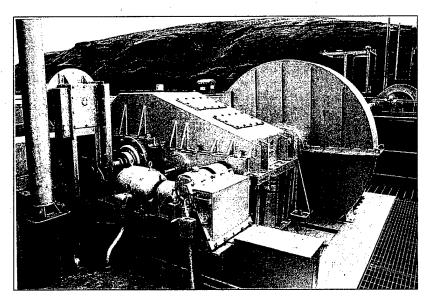


Photo. 30: Gate hoist, typical.

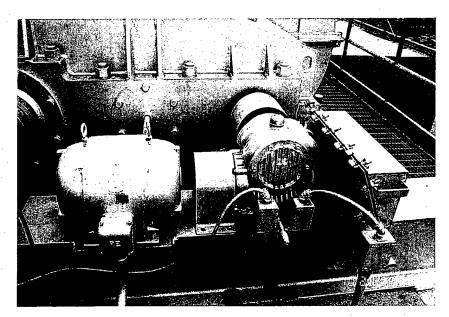


Photo. 31: Hoist motors, typical. Note fluid leaking from beneath motor.

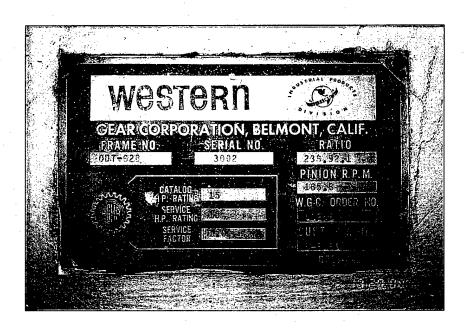


Photo. 32: Hoist manufacture's plate.

The following observations were made at individual gate hoists:

	Hoist and Motor Observations		
Gate 1	None		
Gate 2	The motor bearings are noisy.		
Gate 3	The motor lead wires and heater wires are frayed.		
Gate 4	The motor bearings are noisy and sound dry.		
Gate 5	None		
Gate 6	The hoist brake seized during operation and was adjusted.		
Gate 7	The motor bearings are in need of replacement.		
Gate 8	None		

Table 4: Hoist operation observations.

## **Hoist Amperage Measurements:**

Hoist amperage readings were recorded during opening and closing of the gates in both the loaded and unloaded condition. The readings include the start up and running amperage. Running amperages were recorded for Phase A, B and C. Table 5 lists the opening and closing start up amperage and the average of the three phases for the running amperage for the gates in the unloaded condition. Table 6 lists the same information for the loaded condition.

	Start up	Start up	Running	Running
	Opening	Closing	Opening	Closing
Gate 1	87.6	72.0	10.8	6.5
Gate 2	92.8	81.6	10.8	6.6
Gate 3	96.0	85.6	10.9	6.2
Gate 4	94.4	84.0	11.3	5.5
Gate 5	84.8	78.0	11.6	6.2
Gate 6	99.2	80.0	13.4	6.5
Gate 7	102.0	80.0	11.7	6.1
Gate 8	84.0	74.0	12.1	6.3

Table 5: Unloaded Gate - Hoist Amperage Readings

	Start up Opening	Start up Closing	Running Opening	Running Closing
Gate 1	112.0	110.0	16.0	9.6
Gate 2	103.0	93.6	12.0	6.8
Gate 3	101.0	94.0	11.6	6.4
Gate 4	96.0	75.0	11.7	5.8
Gate 5	93.0	88.0	12.4	6.1
Gate 6	104.0	99.2	13.6	7.5
Gate 7	101.5	86.0	10.9	6.4
Gate 8	102.0	80.0	11.5	6.1

Table 6: Loaded Gate - Hoist Amperage Readings

Based on the consistency of the readings the hoists are in generally good condition. The amperage data indicates that the tainter gate hoist motors are operating well within their design operating limits that normally allow the starting amperage to be in the range of 5 to 8 times the nameplate value. The current draw for all motors were in acceptable range and the gates appeared to be free with no apparent binding. The motors on the hoists are all noisier than would be expected for these units. The motors all have sealed bearings with no lube ports. During the opening of Gate 6 the hoist motor break seized and adjustments to the break were made in order to continue operation, see Photo. 33. The field inspection sheets for the hoist measurements can be found in Appendix B.

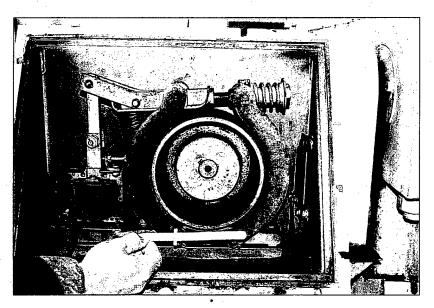


Photo. 33: Seized brake on Gate 6 hoist.

#### RECOMMENDATIONS

## Recommended in the next year or as necessary:

- Repair pitting on skin plate and repaint (or recoat) upstream surface of gate face.
- Install new sacrificial anodes on upstream side of gate. A corrosion expert should be consulted to determine the number and location of anodes required. Existing anodes may remain in place.

These repairs can be undertaken sequentially on all of the gates at once or the repairs could be made on an as-needed basis as the pitting penetrates the skin plate and leaks develop at individual gates.

#### Recommended in the next 2 years:

- Analyze the hoist gearboxes per the manufactures recommendation and remanufacture or replace as required.
- Replace the main gearbox seals on the hoist motors.

#### Recommended in the next 5 years:

- Install drain hole between the multiple stiffeners at ends of the bottom horizontal girders. The recommended size for these drain holes is 1-inch in diameter.
- Install drain holes in the purlin stiffeners near the ends of the bottom horizontal girders (Plate perpendicular to skin plate, above multiple stiffeners on bottom horizontal girder). The recommended size for these drain holes is 1-inch in diameter.
- Install drain holes in the downstream portion of the bottom seal plate between every purlin. Note: the rubber bottom seal is located between the bottom seal plate and the bottom seal keeper plate. The hole should not be flame cut with the rubber bottom seal in place. The recommended size for these drain holes is 1-inch in diameter.
- Enlarge the drain holes at upstream end of lower radial struts. The recommended size for these drain holes is 1 1/2 inch in diameter.
- For all new and enlarged drain holes, the holes should be drilled, not flame cut, to reduce jagged edges which snag debris. If drilling holes is not feasible, then the edges of the flame cut holes should be reamed smooth.

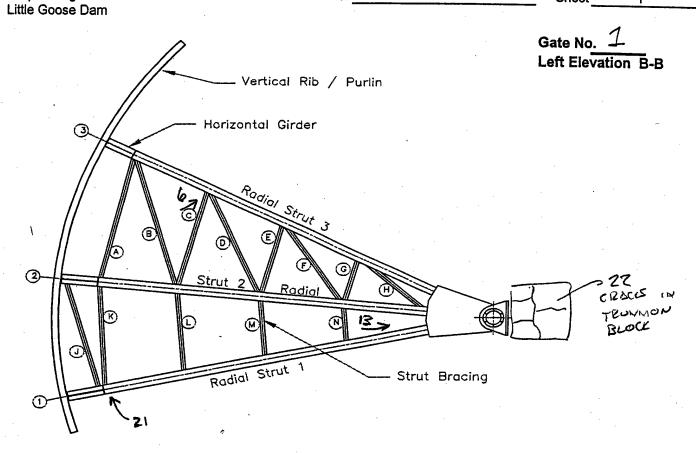
# LITTLE GOOSE DAM

# **REFERENCES**

1. Water Control Manual, Little Goose Lock and Dam, U.S. Army Corps of Engineers, Walla Walla District, February 1988.

HDR	<b>Engine</b>	ering,	Inc.
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Inspection Team SMP TDB HAY Date 10/16/00 Sheet 1



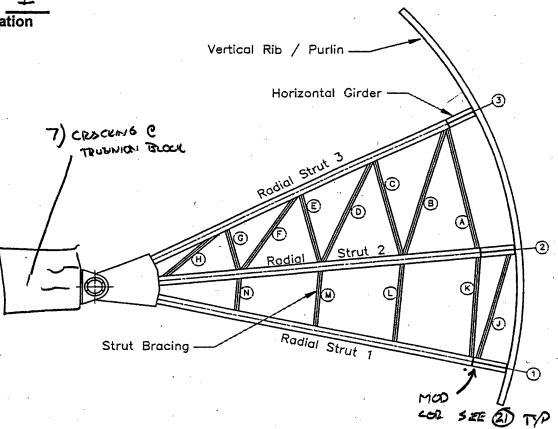
Member	Туре	Type Depth d		N	/eb	Flange(s)			
	1 . [			t <sub>w</sub>		b,		t,	
		Plan	Measured	Plan	Measured	Pian	Measured	Plan	Measured
		(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
Strut 3	14 WF 202	15 5/8	153/4	15/16	-	15 3/4	153/4	1 1/2	11/2
Strut 2	14 WF 342	17 1/2	171/2	1 9/16	~	16 3/8	123/B	2 7/16	21/2
Strut 1	14 WF 398	18 1/4	181/4	1 13/16	1 4	16 5/8	6 3/8	2 13/16	23/4
Brace A	14 WF 30	13 7/8	137/8	5/16		6 3/4		3/8	
Brace B	14 WF 30	13 7/8	137/8	5/16	5/16	6 3/4	63/4	3/8	3/8
Brace C	14 WF 30	13 7/8	14	5/16	5/16	6 3/4	63/4	3/8	3/8
Brace D	14 WF 30	13 7/8	137/8	5/16	5/16	6 3/4	63/4	3/8	3/8
Brace E	14 WF 30	13 7/8	13:3/16	5/16	5/16	6 3/4	63/4	3/8	3/8
Brace F	.14 WF 30	13 7/8	137/8	5/16	5/16	6 3/4	63/4	3/8	3/8
Brace G	14 WF 30	13 7/8	137/8	5/16	5/16	6 3/4	63/4	3/8	3/8
Brace H	14 WF 30	13 7/8	14	5/16	5/16	6 3/4	634	3/8	3/8
Brace J	14 WF 30	13 7/8	137/8	5/16	5/16	6 3/4	63/4	3/8	3/8
Brace K	14 WF 30	13 7/8	137/8	5/16	5/16	6 3/4	654	3/8	3/8
Brace L	14 WF 30	13 7/8	14	5/16	5/16	6 3/4	634	3/8	3/8
Brace M	14 WF 30	13 7/8	13%	5/16	5/16	6 3/4	63/4	3/8	3/8
Brace N	14 WF 30	13 7/8	137/8	5/16	5/16	6 3/4	634	3/8	3/8

21	 MOD	COR-				•	•
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Inspection Team SMP TDB HAY Weather

Date 10/16 Sheet

Gate No. Right Elevation A-A



Member	Type		Depth	V	/eb		Flanç	je(s)	
	1 1		d		t <sub>w</sub>		b,		t <sub>f</sub>
	1 [	Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured
		(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
Strut 3	14 WF 202	15 5/8	155/6	15/16	-	15 3/4	534	1 1/2	11/2
Strut 2	14 WF 342	17 1/2	171/2	1 9/16	1	16 3/8	163/8	2 7/16	21/2
Strut 1	14 WF 398	18 1/4	181/4	1 13/16	15/16	16 5/8	1630	2 13/16	213/16
Brace A	14 WF 30	13 7/8	13 7/8	5/16	\$/16	6 3/4	63/4	3/8	3/8
Brace B	14 WF 30	13 7/8	137/0	5/16	5/16	6 3/4	63/4	3/8	3/6
Brace C	14 WF 30	13 7/8	137/8	5/16	5/10	6 3/4	63/4	3/8	3/8
Brace D	14 WF 30	13 7/8	14	5/16	5/16	6 3/4	63/4	3/8	3/8
Bracè E	14 WF 30	13 7/8	137/8	5/16	5/16	6 3/4	63/4	3/8	3/6
Brace F	14 WF 30	13 7/8	13 15/10	5/16	5/16	6 3/4	63,4	3/8	3/3
Brace G	14 WF 30	13 7/8	137/8	5/16	5/16	6 3/4	63/4	3/8	3/8
Brace H	14 WF 30	13 7/8	14	5/16	5/16	6 3/4	63/4	3/8	3/8
Brace J	14 WF 30	13 7/8	14	5/16	5/16	6 3/4	63/4	3/8	3/8
Brace K	14 WF 30	13 7/8	14	5/16	5/16	6 3/4	63/4	3/8	3/2
Brace L	14 WF 30	13 7/8	13 7/8	5/16	5/16	6 3/4	6314	3/8	3/8
Brace M	14 WF 30	13 7/8	13 7/8	5/16	5/16	6 3/4	63/4	3/8	3/8
Brace N	14 WF 30	13 7/8	137/8	5/16	5/16	6 3/4	63/4	3/8	3/8

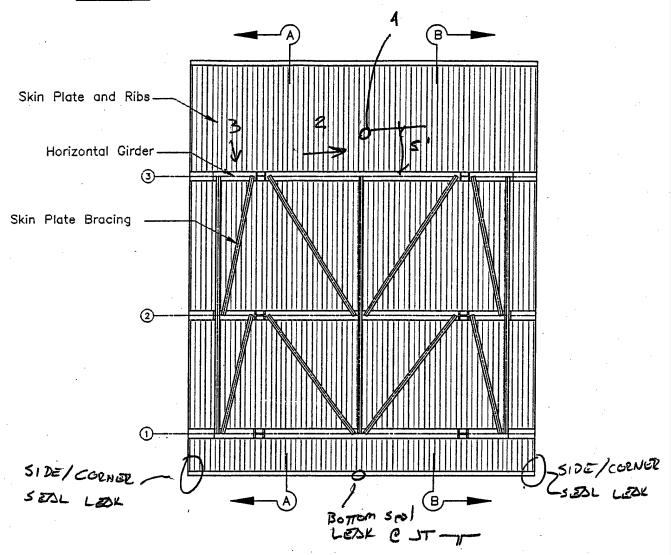
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HDR Engineering, Inc.
Corp of Engineers - Walla Walla
Little Goose Dam

Inspection Team SMP TDB HAY
Weather

Date 10/16
Sheet 3

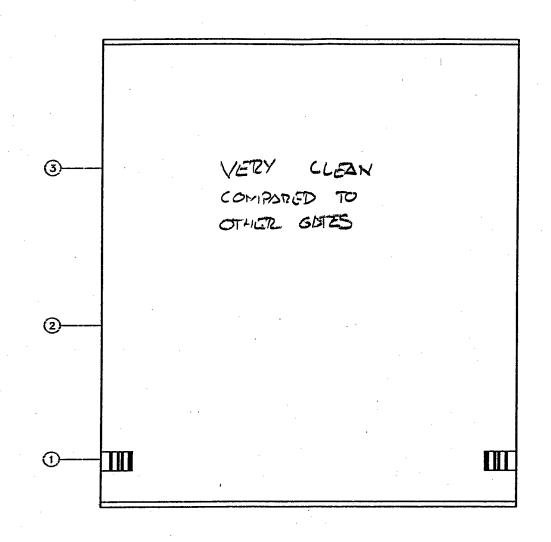
Gate No. 2 Downstream Elevation



Member	Туре	Depth d		Web t <sub>w</sub>		Flange - End			
						b <sub>f</sub>		t <sub>f</sub>	
•		Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured
		(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
Horiz. Girder 3	PL Girder	49 3/4	49 7/8	7/16	7/16	16	16	7/8	7/8
Horiz. Girder 2	PL Girder	60 1/2	601/2	3/4	13/10	16 1/2	161/2	1 1/4	15/16
Horiz. Girder 1	PL Girder	60 1/2	60/2	1		16 1/2	161/2	1 1/4	15/16
Purlins	ST 10 WF 31	10 1/2	101/2	13/32	<u> </u>	8 1/4	81/4	5/8	5/8
Skin Plate Bracing	ST 7 WF 15	7	71/8	1/4	1/4	6 3/4	63/4	3/8	3/8

LIGHT	SURFS	ce cor	- 1	EVIDENCE	STANDING	W672877
2) TYP	TOP	4120 SE				
3) TYP	LIGHT	- cor				
			wap	E GRIND	PATON	

HDR Engineering, Inc.	•	(SMP) TDB HAY	Date	
Corp of Engineers - Walla Walla Little Goose Dam	Weather	- The second	Sheet	4
Gate No. 1 Upstream	n Elevation			



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HDR Enginee Corp of Enginee Little Goose Dan	rs - Walla Walla	Inspection Team SMP TDB HAY AMA Weather CLDY 23°	Date 10/2 Sheet 5	1
Gate No.	1	Operation and Trunnion Measurements		
Racking Meas	urements: Bot	tom of Gate and Spillway		
		I FFT   DIGHT		i

Transverse Trunnion Hub Movement, No. Load on Gate: Closed-One	

	LEFT				
	Inside	Outside (pier)			
Initial Gate Closed	20/32	14/32			
Gate Full Open	19/32	15/32			
Final Gate Closed	20/32	14/32			

	HT
Inside	Outside (pier)
70/32	15/32
20/32	15/32
20/32	15/32

#### 3-D Trunnion Hub Movements - Unloaded vs. Loaded

		LEFT				
	No	Load	Full Load			
	Voic	i Dry	Voic	l Full		
Vertical	0.00	00	0,0065			
US / DS	0.00	00	+0.0335			
Transverse	2932	15/32	2932	15/32		
	Inside	Outside	Inside	Outside		

RIGHT						
No L	_oad	Full	Load			
Void	Dry	Void	l Full			
0.00	00	0.000				
+0,00	06 <b>5</b>	+0.0365				
20/32	14/32	21/32	14/32			
Inside	Outside	Inside	Outside			

HDR	Engin	eering,	Inc.
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Vertical Rib / Purlin

Horizontal Girder

Inspection Team SMP TDB HAY (AMA) Weather SUHNY

- Strut Bracing

Date 10/17/00 Sheet

Gate No. Z Left Elevation B-B

9 US side of brace N typical light rust

(14) entire fam.

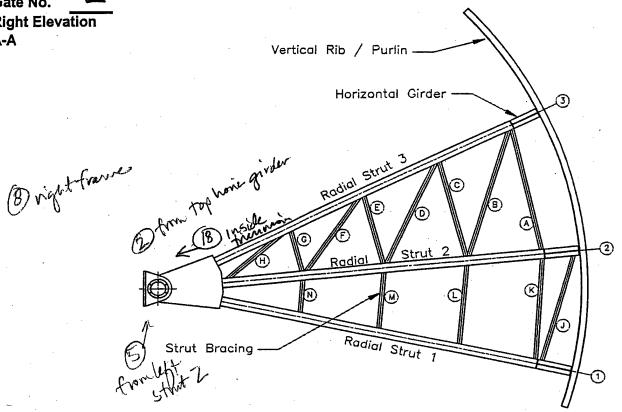
0			Kadia				,		
				·	<i>"</i>			(-)	
Member	Туре	ı	Depth		eb i		Flans b,	ge(S)	t
	1 }	Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured
·	1	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
Strut 3	14 WF 202	15 5/8	155/8	15/16		15 3/4	153/4	1 1/2	11/2
Strut 2	14 WF 342	17 1/2	173/4	1 9/16		16 3/8	163/8	2 7/16	27/16
Strut 1	14 WF 398	18 1/4	185/16	1 13/16	13/4	16 5/8	1612	2 13/16	123/4
Brace A	14 WF 30	13 7/8	14	5/16		6 3/4	018	. 3/8	3/8
Brace B	14 WF 30	13 7/8	14	5/16	·	6 3/4	63/4	3/8	5/8
Brace C	14 WF 30	13 7/8	10	5/16		6 3/4	63/4	3/8	3/8
Brace D	14 WF 30	13 7/8	137/8	5/16		6 3/4	67/9	3/8	3/2
Brace E	14 WF 30	13 7/8	14	5/16		6 3/4	63/4	3/8	3/3
Brace F	14 WF 30	13 7/8	4	5/16		6 3/4	67/8	3/8	3/8
Brace G	14 WF 30	13 7/8	<b>) '</b>	5/16		6 3/4	63/4	3/8	3/0
Brace H	14 WF 30	13 7/8	L	5/16		6 3/4	63/4	3/8	3/8
Brace J	14 WF 30	13 7/8	14	5/16		6 3/4	107/8	3/8	3/8
Brace K	14 WF 30	13 7/8	14	5/16		6 3/4	67/8	3/8	3/8
Brace L	14 WF 30	13 7/8	14	5/16		6 3/4	634	3/8	3/8
Brace M	14 WF 30	13 7/8	Cif	5/16		6 3/4	63/4	3/8	3/8
Brace N	14 WF 30	13 7/8	14	5/16	•	6 3/4	63/4	3/8	3/8

HDR	Engineer	ing, l	lnc.

Inspection Team SMP TDB HAY AMA
Weather

Date 10/17 Sheet

Gate No. Right Elevation A-A



Member Type		Depth		W	Web		Flange(s)			
	} <u></u>	· · d		1	t.,		b <sub>f</sub>		tı	
	1	Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured	
	<u> </u>	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	
Strut 3	14 WF 202	15 5/8		15/16		15 3/4		1 1/2		
Strut 2	14 WF 342	17 1/2	171/2	1 9/16		16 3/8	163/8	2 7/16	27/16	
Strut 1	14 WF 398	18 1/4	183/8	1 13/16	1314	16 5/8	1672	2 13/16	2/3/16	
Brace A	14 WF 30	13 7/8	14	5/16		6 3/4	63/4	3/8	3/8	
Brace B	14 WF 30	13 7/8		5/16		6 3/4		3/8		
Brace C	14 WF 30	13 7/8		5/16		6 3/4		3/8		
Brace D	14 WF 30	13 7/8		5/16		6 3/4	1	3/8		
Brace E	14 WF 30	13 7/8		5/16		6 3/4		3/8	7	
Brace F	14 WF 30	13 7/8		5/16		6 3/4		3/8		
Brace G	14 WF 30	13 7/8		5/16		6 3/4	1	3/8		
Brace H	14 WF 30	13 7/8		5/16		6 3/4	(	3/8		
Brace J	14 WF 30	13 7/8	137/8	5/16		6 3/4	13/4	3/8	3/8	
Brace K	14 WF 30	13 7/8	14	5/16		6 3/4	63/4	3/8	3/8	
Brace L	14 WF 30	13 7/8	14	5/16		6 3/4	63/4	3/8	3/8	
Brace M	14 WF 30	13 7/8	14	5/16		6 3/4	6314	3/8	3/8	
Brace N	14 WF 30	13 7/8	14	5/16		6 3/4	63/4	3/8	3/8	

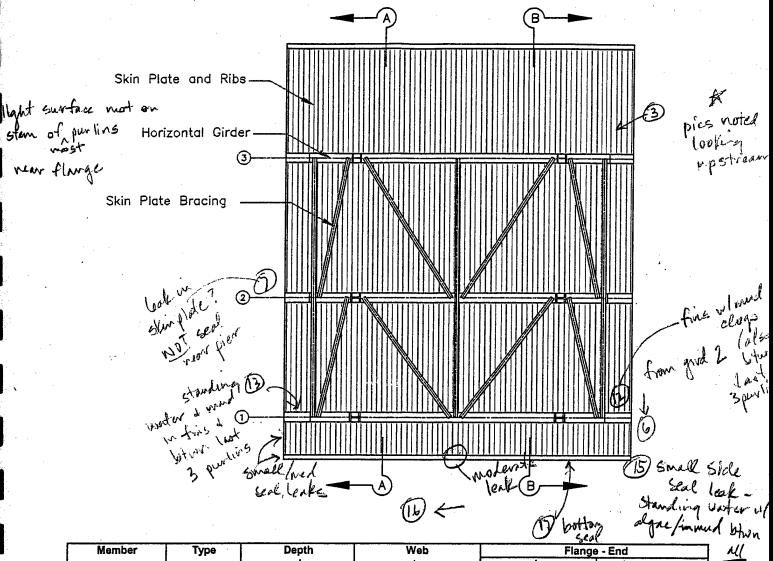
HDR	Engin	eering,	Inc.
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Inspection Team SMP TDB HAY AND Weather

Date 10/17 Sheet 3

Gate No.

2 Downstream Elevation



Member	Type	Type Depth Web Flange - End				Depth Web Flange - End			
			d		t <sub>w</sub>		b <sub>f</sub>	ţ,	
		Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured
		(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
Horiz. Girder 3	PL Girder	49 3/4	50	7/16	7/16	16	16	7/8	30/32.
Horiz. Girder 2	PL Girder	60 1/2	601/2	3/4	314	16 1/2	161/2	1 1/4	11/4
Horiz. Girder 1	PL Girder	60 1/2	6012	1	1	16 1/2	16/2	1 1/4	11/4
Purlins	ST 10 WF 31	10 1/2	101/2	13/32		8 1/4	91/4	5/8	9/16
Skin Plate Bracing	ST 7 WF 15	7	7 7	1/4	5/16	6 3/4	67/3	3/8	3/8

purlins a botton

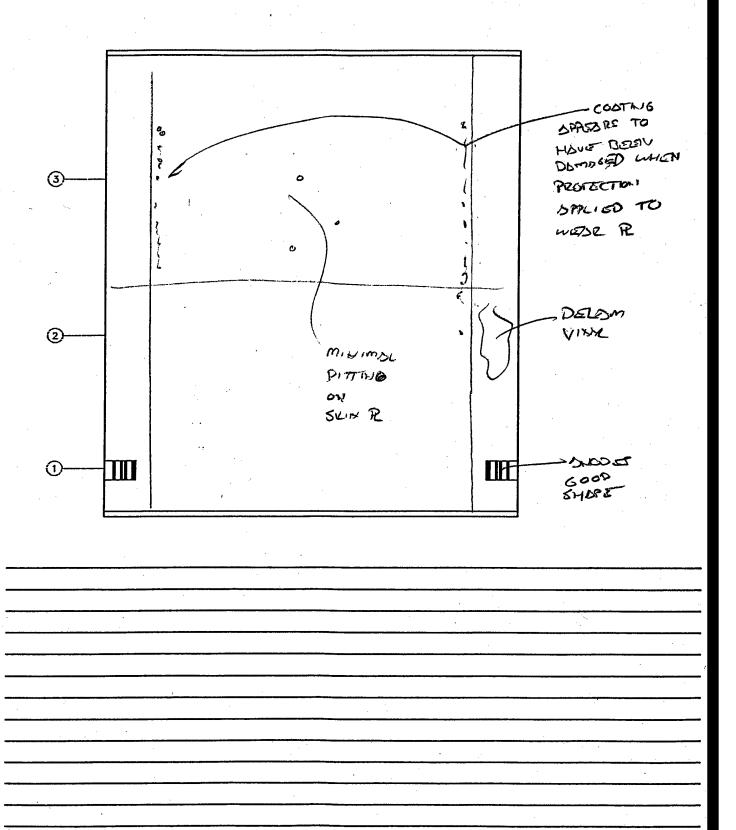
HDR Engineering, Inc.
Corp of Engineers - Walla Walla
Little Goose Dam

Inspection Team Weather CLDY 45

Date 10/20 Sheet 4

Gate No.

2 Upstream Elevation



HDR Engineering, Inc.	
Corp of Engineers - Walla Wall	í
Little Goose Dam	

Inspection Team	SMP	TDB	HAY	AMA	
Weather <sup>-</sup>	CL	DY	50		•

Date	10	120	100
Sheet		5	

Gate	No.

2

**Operation and Trunnion Measurements** 

Racking Measurements: Bottom of Gate and Spillway

LE	FT
39	1/2

RIGI	HT	
39	1/2	

Transverse Trunnion Hub Movement, No Load on Gate: Closed-Open-Closed

	LE	FT
	Inside	Outside (pier)
Initial Gate Closed	22/32	9/32
Gate Full Open	22/32	10/32
Final Gate Closed	22/32	10/3Z

RIC	RIGHT			
Inside	Outside (pier)			
17/32	21/32			
17/32	21/32			
17/32	22/32			

#### 3-D Trunnion Hub Movements - Unloaded vs. Loaded

	LEFT				
	No L	_oad	, Full	Load	
	Voic	Dry	Void	Full	
Vertical	0.000			20	
US / DS	0.0000		0.02	119	
Transverse	22/32	10/32	22/32	10/32	
	Inside	Outside	Inside	Outside	

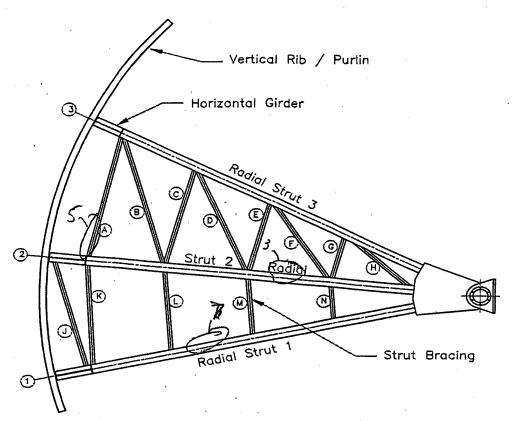
RIGHT					
No l	_oad	Full	Load		
Voic	l Dry	Void	Full		
~o,~	205	0.0045			
to.0005		+0,0225			
17/32	<sup>22</sup> /32	18/32	22/32		
Inside	Outside	Inside	Outside		

	•		
,	)		
		<u> </u>	
			•

Inspection Team SMP TDB HAY
Weather WELLT, WAC

Date 10/12/200 Sheet 1

Gate No. 5
Left Elevation B-B



Member	Type	1	Depth	V	/eb		Flan	ge(s)	
İ	1 [		d		t.,		b <sub>f</sub>	•	t <sub>i</sub>
l '		Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured
		(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
Strut 3	14 WF 202	15 5/8	153/4	15/16		15 3/4	15 3/4	1 1/2	1/2
Strut 2	14 WF 342	17 1/2	177114	1 9/16		16 3/8	160 3/16	2 7/16	27116
Strut 1	14 WF 398	18 1/4	181/4	1 13/16		16 5/8	161/2	2 13/16	23/6
Brace A	14 WF 30	13 7/8	137/8	5/16		6 3/4	Ce 13/40	3/8	7/B
Brace B	14 WF 30	13 7/8	14	5/16		6 3/4	674	3/8	3/6
Brace C	14 WF 30	13 7/8	135/16	5/16		6 3/4	63/4	3/8	3/8
Brace D	14 WF 30	13 7/8	13/5/60	5/16	·	6 3/4	63/4	3/8	3/8
Brace E	14 WF 30	13 7/8	1315/16	5/16		6 3/4	(013AH	3/8	3/8
Brace F	14 WF 30	13 7/8	37/4	5/16		6 3/4	67/2	3/8	3/8
Brace G	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	63/4	3/8	1/6
Brace H	14 WF 30	13 7/8	14 3/1ce	5/16		6 3/4	63/4	3/8	1/8
Brace J	14 WF 30	13 7/8	1315/14	5/16		6 3/4	63/4	3/8	3/8
Brace K	14 WF 30	13 7/8	13 15/10	5/16		6 3/4	63/4	3/8	3/8
Brace L	14 WF 30	13 7/8	135/16	5/16		6 3/4	63/4	3/8	45
Brace M	14 WF 30	13 7/8	13/5/16	5/16		6 3/4	63/4	3/8	3/2
Brace N	14 WF 30	13 7/8	1315/16	5/16		6 3/4	63/4	3/8	3/4,

3. Splattered Conscients on 1 Strong Street.

4. OVERALL Shot of LFT Frame NOTE. Concrete Splitter and Light Rust

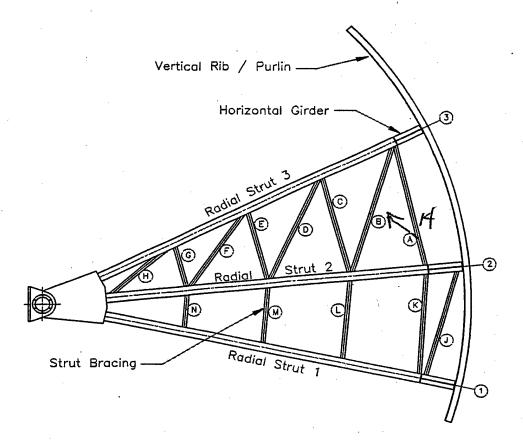
5. Vert Brace Light RUST Tip. All braces

7. Concrete Statter on Bot. Start

Inspection Team SMP TDB HAY
Weather

Date 10/12
Sheet 2

Gate No. A-A



Member	Type	Depth		W	/eb		Flang	ge(s)	
	1 [		d		t.,		b <sub>f</sub>	**	
İ	i [	Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured
		(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
Strut 3	14 WF 202	15 5/8	13/16	15/16		15 3/4	15 49	1 1/2	11/2
Strut 2	14 WF 342	17 1/2	1712	1 9/16		16 3/8	1614	2 7/16	2/2
Strut 1	14 WF 398	18 1/4	18,3116	1 13/16		16 5/8	167/11	2 13/16	2016
Brace A	14 WF 30	13 7/8	134	5/16	·	6 3/4	103/4	3/8	3/8
Brace B	14 WF 30	13 7/8	137/8	5/16		6 3/4	674	3/8	<b>3∕</b> 8
Brace C	14 WF 30	13 7/8	1313/10	5/16		6 3/4	63/16	3/8	3/9.
Brace D	14 WF 30	13 7/8	13 546	5/16		6 3/4	6016	. 3/8	3/8
Brace E	14 WF 30	13 7/8	133/4	5/16		6 3/4	6 18/16	3/8	3/8
Brace F	14 WF 30	13 7/8	131/8	5/16		6 3/4	613/16	3/8	3/8
Brace G	14 WF 30	13 7/8	1315/16	5/16		6 3/4	63/4	3/8	3/8
Brace H	14 WF 30	13 7/8	1315/10	5/16		6 3/4	1.3/4	3/8	3/4
Brace J	14 WF 30	13 7/8	14	5/16		6 3/4	63/4	3/8	3/0
Brace K	14 WF 30	13 7/8	19	5/16		6 3/4	613/16	3/8	3/4
Brace L	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	63/4	3/8	3/8
Brace M	14 WF 30	13 7/8	13/5/16	5/16		6 3/4	63/4	3/8	3/8
Brace N	14 WF 30	13 7/8	13 7/6	5/16		6 3/4	63/4	3/8	1/8

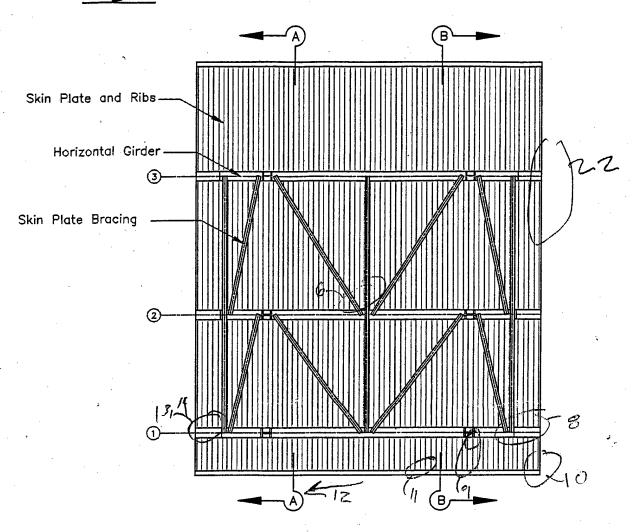
14. Shot of FRM. NOTE Light Rust on Most Members

Inspection Team SMP TDB HAY
Weather

Date 10/12
Sheet 3

Gate No.

5 Downstream Elevation



Member	Member Type			Web		Flange - End			
		d		t,, i		D <sub>f</sub>		t <sub>f</sub>	
		Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured
		(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
Horiz. Girder 3	PL Girder	49 3/4	50	7/16	7/10	16	16	7/8	7/8
Horiz. Girder 2	PL Girder	60 1/2	(05 7/16	3/4	3A'	16 1/2	169116	1 1/4	[1/4
Horiz. Girder 1	PL Girder	60 1/2	601/2	1	1716	16 1/2	16/2	1 1/4	11/4
Purlins	ST 10 WF 31	10 1/2	101/2	13/32	9/16	8 1/4	B 5/16	5/8	
Skin Plate Bracing	ST 7 WF 15	7	7	1/4	3716	6 3/4	6 2/4	3/8	3/8

2. LEFT Pulling eight Rust W Mine Deposits

6. Light RUST ON Bracing Typ.

8. Stanspiring Has Oal Bot. Linear NOTE light Rust

9. Drain hole W/Continuous Flow from about

10. SIDE SEAL LEAK, (LEFT)

11. Standary the and Much @ Bot 17+

12 looking RT. Along botton JEAI

13.19 Moderate to heavy Rust @ Bat Giere @ Brace Mts

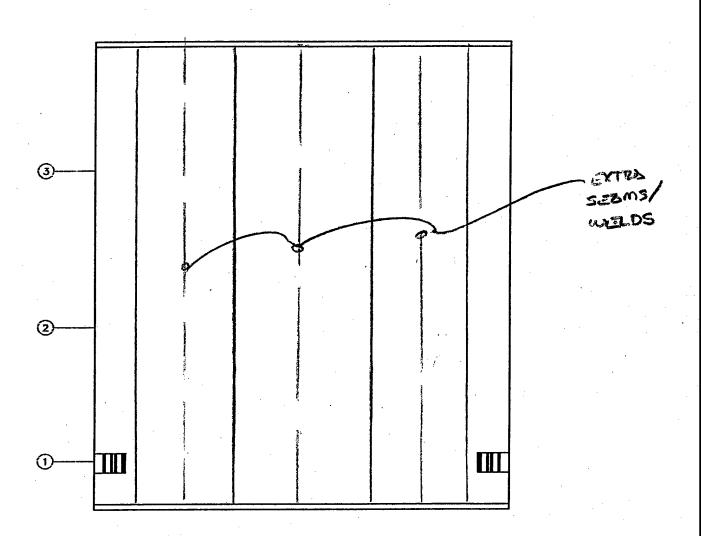
HDR Engineering, Inc.
Corp of Engineers - Walla Walla
Little Goose Dam

Inspection Team SMP TDB HAY AMD
Weather

Date 10/19 Sheet 4

Gate No.

\_\_\_\_Upstream Elevation



	- NOT	PITS	TOP	20'					
				· .					
					 	<del> </del>		<del></del>	
		2.7.7							
					 ۶.				
							`		
No.						,			

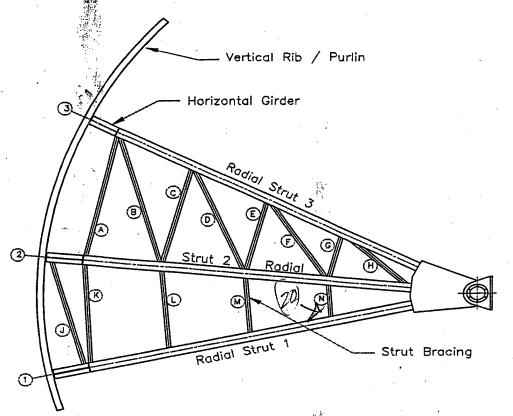
HDR Engineer Corp of Engineers			m SMP TDB HAY		Date _ Sheet _	10/19/00
Little Goose Dam						
Gate No.	<u>_</u>	Operation and T	runnion Measur	ements		
		_				
Racking Measu	rements: Botto	om of Gate and S	pillway			÷
		LEFT	RIGHT	I ·		
		42	42	- 10 - 1		
Transverse Trui	nnion Hub Mov	ement, No Load	on Gate: Closed	l-Open-Closed		
	LE	EFT 1	RIC	ЭНТ		
·	Inside	Outside (pier)	Inside	Outside (pier)		
Initial Gate Closed	28/32	18/32	18/32	14/32		
Gate Full Open	28/32	18/32	18/32	14/32		
Final Gate Closed	28/32	18/32	18/32	14/32	r.	
		<u>.</u>	<u> </u>			
		,				
						,
3-D Trunnion H	ub Movements	- Unloaded vs. L	oaded			
	LI	FT	RIC	SHT		
	No Load	Full Load	No Load	Full Load		
	Void Dry	Void Full	Void Dry	Void Full		
Vertical	+0.0005	+0,0070	-0,0010	0.0130		
US / DS	D.0000	+0.0308	70,0025	+0.0750		
Transverse	Z8/32 18/32	78/32 18/32	18/32 14/32	19/32 13/32		
	Inside Outside	Inside Outside	Inside Outside	Inside Outside	,	s.
						,

<b>HDR</b>	Engi	neerir neers -	ng,	Inc	
Corp o	f Engli	neers -	Wal	la W	/alla
l'ittle C	Annea I	Dam 🦫			

Inspection Team SMP TDB (AX)
Weather OVERCAST (22)

Date /0//2/00 Sheet 1

Gate No. 4 Left Elevation B-B



Member	Туре		Depth	W	/eb		Flan	ge(s)	
			d		<b>L</b> .,		b <sub>t</sub>		t <sub>t</sub>
	I I	Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured
	1	(in)	(in) ,	(in)	(in)	(in)	(in)	(in)	(in)
Strut 3	14 WF 202	15 5/8	5/18	15/16		15 3/4	1/	1 1/2	
Strut 2	14 WF 342	17 1/2		1 9/16		16 3/8	/ , ,	2 7/16	1
Strut 1	14 WF 398	18 1/4	- 4/.	1 13/16		16 5/8	11/1/2	2 13/16	V.
Brace A	14 WF 30	13 7/8	14	5/16		6 3/4		3/8	5/16
Brace B	14 WF 30	13 7/8	135/16	5/16	·	6 3/4	1	3/8	5/16
Brace C	14 WF 30	13 7/8	315/16	² 5/16	'stranger	6 3/4	<b>V</b>	3/8	5/16
Brace D	14 WF 30	13 7/8	12/2010	5/16		6 3/4	رسليد	3/8	5/16
Brace E	14 WF 30	13 7/8	147	5/16		6 3/4	10/110	3/8	V
Brace F	14 WF 30	13 7/8	1	5/16		6 3/4	Val	3/8	5/16
Brace G	14 WF 30	13 7/8	Ź	5/16		6 3/4	11214	:3/8	V
Bráce H	14 WF 30	13 7/8	V	5/16		6 3/4	1/2/16	7 ,3/8	5/10
Brace J	14 WF 30	13 7/8	14	5/16		6 3/4		3/8	14
Brace K	14 WF 30	13 7/8	14.	5/16	<u></u>	6 3/4	V.	3/8	V
Brace L	14 WF 30	13 7/8	13.3/A	5/16	سد	6 3/4	61/8	3/8	V :
Brace M	14 WF 30	13 7/8	14	5/16		6 3/4	V	3/8	V
Brace N	14 WF 30	13 7/8	12	5/16		6 3/4	. V	3/8	

20 to Fine lawy of mand flowing off, try

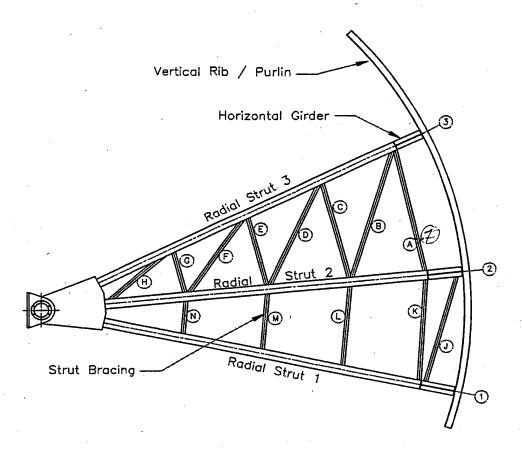
23) gate face-rate minut

24 Eid Seals, left

Inspection Team SMP TDB HAY Weather

Date \_\_\_\_\_ Sheet 2

Gate No.
Right Elevation
A-A



Member	Type	. 1	Depth	W	eb .		Flan	ge(s)	
			d ·		<b>.</b>		b <sub>f</sub>		t <sub>i</sub>
	l f	Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured
	1	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
Strut 3	14 WF 202	15 5/8	1	15/16	<del></del>	15 3/4		1 1/2	
Strut 2	14 WF 342	17 1/2	177/w	1 9/16		16 3/8	1649	2 7/16	V
Strut 1	14 WF 398	18 1/4	1.4	1 13/16		16 5/8	\\ \tag{'}	2 13/16	V
Brace A	14 WF 30	13 7/8	3/	5/16	~~··	6 3/4	Ř,	3/8	1418
Brace B	14 WF 30	13 7/8	ν',	5/16	~	6 3/4	V	3/8	
Brace C	14 WF 30	13 7/8	12/5/10	5/16		6 3/4	V	3/8	MIV
Brace D	14 WF 30	13 7/8	13/10	5/16		6 3/4		3/8	レ
Brace E	14 WF 30	13 7/8	14	5/16		6 3/4		3/8	~
Brace F	14 WF 30	13 7/8	35/10	5/16	-	6 3/4	10 1/10	3/8	5/10
Brace G	14 WF 30	13 7/8	13/5/110	5/16		6 3/4	101/110	3/8	5/16
Brace H	14 WF 30	13 7/8	14	5/16		6 3/4		3/8	5/16
Brace J	14 WF 30	13 7/8	y	5/16		6 3/4		3/8	
Brace K	14 WF 30	13 7/8		5/16		6 3/4	V .	3/8	V
Brace L	14 WF 30	13 7/8	1/	5/16		6 3/4	V1/8	3/8	1
Brace M	14 WF 30	13 7/8	~	5/16		6 3/4	/	3/8	5/16.
Brace N	14 WF 30	13 7/8	14	5/16		6 3/4	/	3/8	. 🗸

P Strange vised marks, like can't buttons on skin plate also.

(5 Corporon boutch, bad dining

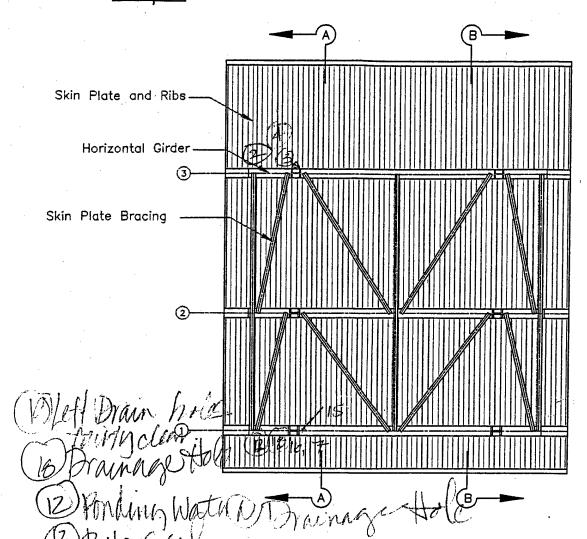
HDR Engineering, Inc.	
Corp of Engineers - Walla W	
Little Goose Dam	

Inspection Team SMP TDB HAY Weather

Date 3

Gate No.

Downstream Elevation



Member "	V Type"	Depth		Web		Flange - End			
			d t.,			b <sub>f</sub>	t,		
	İ	Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured
		(in)	(in) 🔑	(in)	(in)	(in)	(in)	(in)	(in)/
Horiz. Girder 3	PL Girder	49 3/4	V	7/16	* V	16		7/8	1
Horiz. Girder 2	PL Girder	60 1/2	1003/10	3/4	. /	16 1/2	1/	1.1/4	15/110
Horiz. Girder 1	PL Girder	60 1/2		7 1		16 1/2		1 1/4	15/10
Purlins	ST 10 WF 31	10 1/2	V	13/32		8 1/4		5/8	1
Skin Plate Bracing	ST 7 WF 15	7	10 15/10	1/4	5/10	6 3/4	1.7	3/8	1.7

Definition to powling the face the modern on ends.

(2) Stiffening not welded to had face the modern on ends.

(2) Strang Divite and painting makes the modern what

(2) Strang Divite and painting makes the modern what

(3) I GAN Must an Vertical Braces

(4) Strang Must an Vertical Braces

(5) Fordamin Flance porter (15).

(17) After (14) Cobertma Water, Fot al, center

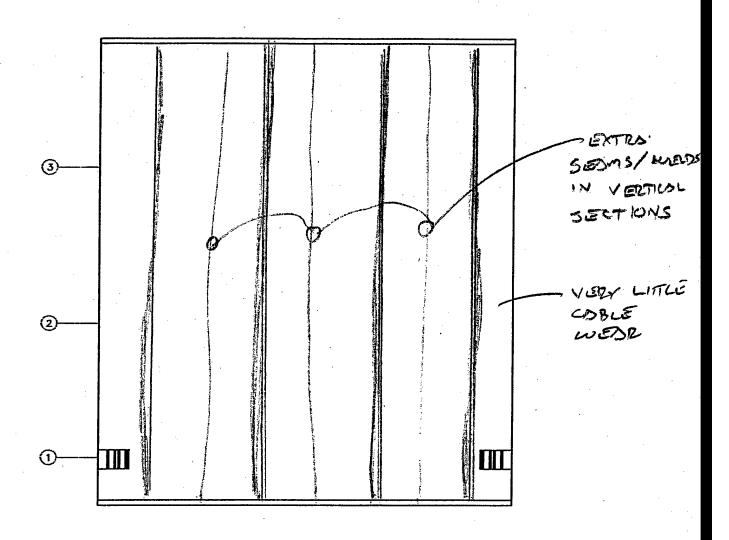
HDR Engineering, Inc.
Corp of Engineers - Walla Walla
Little Goose Dam

Inspection Team SMP TDB HAY △M△
Weather 5000 60

Date 10/19
Sheet 4

Gate No.

4 Upstream Elevation



TYDICAL	PITTING .	LIGHTETZ	THON	USUAL	
	,				•
				,	
			······································		
			<del></del>		

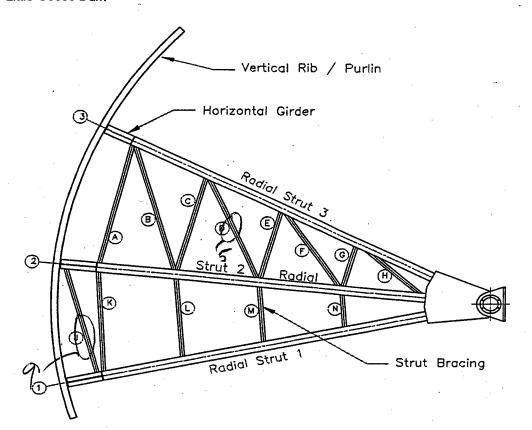
UDD Engineer	I		014D TDD 1141	` .,	D
<b>HDR Engineer</b> Corp of Engineers Little Goose Dam			m SMP TDB HA er Sonny Go		Date 10/19/0 Sheet 5
Gate No.	4	Operation and <sup>-</sup>	Trunnion Measur	ements	
·			· · · · ·	e <sup>*</sup>	
Racking Measu	rements: Bot	tom of Gate and S	ipiliway	_	
		LEFT	RIGHT		MUCH LEXIKAGE FLOW FROM
	,			576	PLOGS TO ASURE
	•	•			
Transverse Trui	nnion Hub Mo	ovement, No Load	on Gate: Close	d-Open-Closed	
		EFT		3HT	
	Inside	Outside (pier)	Inside	Outside (pier)	
Initial Gate Closed	15/32	13/32	14/32	27/32	•
Gate Full Open	15/32	12/32	14/32	27/32	
Final Gate Closed	15/32	12/32	14/32	28/32	
			4		
3-D Trunnion H	ub Movement	s - Unloaded vs. L	oaded		
	<u> </u>	EFT	Ric		
	No Load Void Dry	Full Load Void Full	No Load Void Dry	Full Load Void Full	
Vertical	0,0000	+0,0030	-0.0010	70.0085	
US / DS	0.0000	+0.0320	-0.0020	+0.0250	
Transverse	15/32 12/32	15/32 12/32	14/32 28/32	14/32 27/32	
	Inside Outsid	e Inside Outside	Inside Outside	Inside Outside	
		<del></del>			

<b>HDR</b> Engineer	ing, Inc.
Corp of Engineers	
Little Goose Dam	

Inspection Team SMR TDB HAY Weather

Date 10/11/2007

Gate No. 5 Left Elevation B-B



Member	Type	٠.	Depth	W	/eb		Flang	ge(s)	
	1 [		d	1	· ·		b <sub>f</sub>		t <sub>f</sub>
	1 . [	Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured
		(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
Strut 3	14 WF 202	15 5/8	13:3/16	15/16		15 3/4	153/4	1 1/2	11/2
Strut 2	14 WF 342	17 1/2	1712	1 9/16		16 3/8	163/16	2 7/16	27/16
Strut 1	14 WF 398	18 1/4	18 79	1 13/16		16 5/8	110/2	2 13/16	234
Brace A	14 WF 30	13 7/8	15 1/6	5/16		6 3/4	67/2	3/8	3/8
Brace B	14 WF 30	13 7/8	13 119	5/16		6 3/4	63/4	3/8	30
Brace C	14 WF 30	13 7/8	19 15/16	5/16		6 3/4	678	· 3/8	13
Brace D	14 WF 30	13 7/8	13/3/110	5/16		6 3/4	1.710	3/8	3/0
Brace E	14 WF 30	13 7/8	1315/16	5/16		6 3/4	6 3/4	3/8	7/9
Brace F	14 WF 30	13 7/8	13 15/10	5/16		6 3/4	67E	3/8	3/0
Brace G	14 WF 30	13 7/8	1315/16	5/16		6 3/4	670	3/8	3/0
Brace H	14 WF 30	13 7/8	14	5/16	`.	6 3/4	61/16	3/8	70
Brace J	14 WF 30	13 7/8	137/0	5/16		6 3/4	1013/16	3/8	3/8
Brace K	14 WF 30	13 7/8	13 18	5/16		6 3/4	613/16	3/8	1/8
Brace L	14 WF 30	13 7/8	13/5/16	5/16		6 3/4	63/4	3/8	3/9)
Brace M	14 WF 30	13 7/8	135/16	5/16		6 3/4	6'3/16	3/8	310
Brace N	14 WF 30	13 7/8	137/6.	5/16		6 3/4	6719	3/8	1/0)

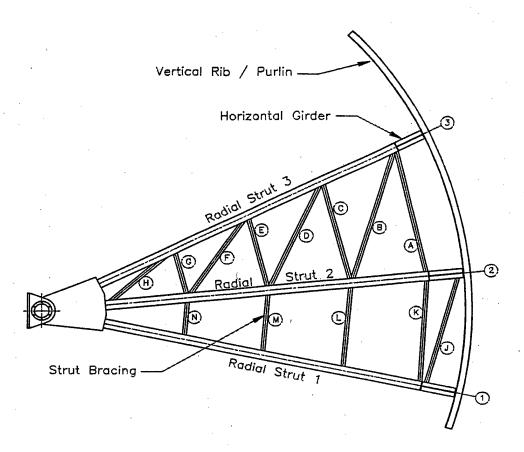
5. Paint FAILURE W/ Light Root (Typ All Graces)
9. Light RUST ON DIA BRACE (Typ)

13. OVERALL Shot of LEFT FRAME MOTE BAD PAINT

HDR Engineering, Inc.
Corp of Engineers - Walla Walla
Little Goose Dam

Inspection Team SMP (TDB) HAY Date 10/11
Weather Sheet 2

Gate No. 5
Right Elevation A-A



Member	Туре	Depth		. W	Web		Flange(s)			
		đ .		t <sub>w</sub> [		b <sub>f</sub>		t,		
		Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured	
		(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	
Strut 3	14 WF 202	15 5/8	15 18	15/16		15 3/4	15 1/4	1 1/2	142	
Strut 2	14 WF 342	17 1/2	171/2	1 9/16		16 3/8	103/16	2 7/16	27/16	
Strut 1	14 WF 398	18 1/4	183/8	1 13/16		16 5/8	16/2	2 13/16	27/8	
Brace A	14 WF 30	13 7/8	1315/16	5/16		6 3/4	6 15/16	3/8	3/2	
Brace B	14 WF 30	13 7/8	137/8	5/16		6 3/4	613/16	3/8	3/9	
Brace C	14 WF 30	13 7/8	13 5/16	5/16		6 3/4	67/2	3/8	3/0	
Brace D	14 WF 30	13 7/8	1376315/1	5/16		6 3/4	676	3/8	2/8	
Brace E	14 WF 30	13 7/8	13/5/16	5/16		6 3/4	61710	3/8		
Brace F	14 WF 30	. 13 7/8	14	5/16		6 3/4	6314	3/8	3/8	
Brace G	14 WF 30	13 7/8	1315/16	5/16		6 3/4	63/4	3/8	1/8	
Brace H	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	63/4	3/8	10	
Brace J	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	6 B/10	3/8	3/8	
Brace K	14 WF 30	13 7/8	1315/11.	5/16		6 3/4	le 3/4	3/8	2/8	
Brace L	14 WF 30	13 7/8	1315/16	5/16		6 3/4	63/4	3/8	3/8	
Brace M	14 WF 30	13 7/8	13/5/16	5/16		6 3/4	63/4	3/8	36	
Brace N	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	634	3/8	3/43	

14. OverAll Pic of Gate

15. LEFT TRUNNION

16. RT. Trumions W/Clogged Drain hole

HDR	Engineering,	Inc.
Com	of Engineers - Wa	lla Wall

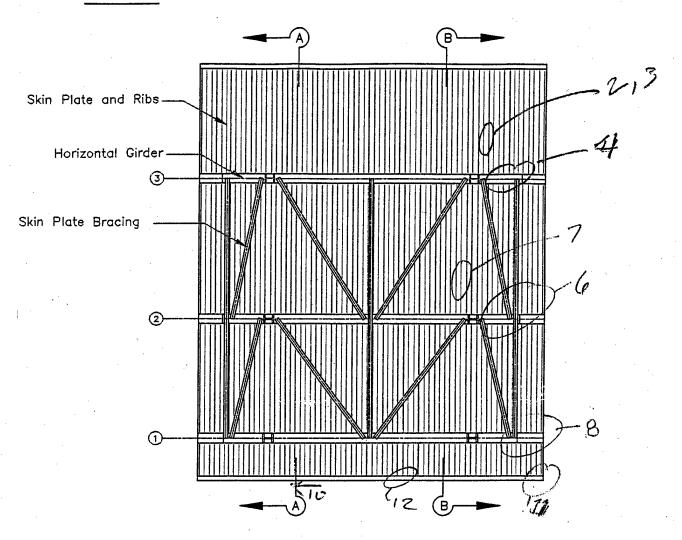
Inspection Team SMP TDB HAY
Weather

Date 10/11 Sheet 3

Gate No.

Little Goose Dam

S Downstream Elevation



Member	Туре	D	epth		Web		Flange	- End	
İ			d		t.,		b <sub>f</sub>	ţ,	
		Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured
		(in)	(in)	(in)	(in)	· (in)	(in)	(in)	(in)
Horiz. Girder 3	PL Girder	49 3/4	49719	7/16	7/16	16	16	7/8	2/0
Horiz. Girder 2	PL Girder	60 1/2	le"/2	3/4		16 1/2	1101/2	1 1/4	11/4
Horiz. Girder 1	PL Girder	60 1/2	6 49	1	1186	16 1/2	161/2	1 1/4	11/14
Purlins	ST 10 WF 31	10 1/2	10/2	13/32		8 1/4	844	5/8	5/8
Skin Plate Bracing	ST 7 WF 15	7	7	1/4	5/110	6 3/4	6319	3/8	3/8

23. Palanizated Post and light lost ON LANCE FACE

1. Light Rust Tap Children

C. Light Rust on Siders AND BRACES NOTE Delam on gate FACE
7. The land on gate face w/ light Rust. These Delam spots ALE TYP Across

ENTILE GATE FACE.

8. 5,02 SEAT IFAK & Bot GIRDER NOTE Light Port & MINISTRAL Dep.

10. Botton Spal looking Right

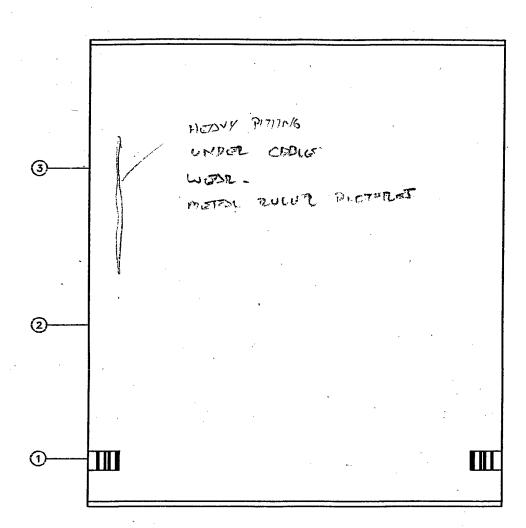
11. LEFT PANER lenk

12, Botton Plate W/STANDING HED

HDR Engineering, Inc.				
Corp of Engineers - Walla Walla				
Little Goose Dam				

Inspection Team SMP TDB HAY Date 10//3 Sheet Sheet

Gate No. \_\_\_\_\_ Upstream Elevation



- BEST CONT	DITION OF	SNY GOTTES SI	201		
- MINIMAL	PITTING				٠
- BXCOSSIVE	SIDP LOS	LESK , COULD	NOT GO	UNDER	
SILL DO	TO FOUNG	WATER_			
:					

HDR Engineering, Inc.	Inspection Team	SMP TDB HAY AMA	Da
Corp of Engineers - Walla Walla Little Goose Dam	Weather	CLDY SS'	She

Date	10/18
Sheet	5

Gate No.	5	Operation and Trunnion Measurements
----------	---	-------------------------------------

## Racking Measurements: Bottom of Gate and Spillway

LE	FT
39	1/4

 RIGHT
39

# Transverse Trunnion Hub Movement, No Load on Gate: Closed-Open-Closed

. •	LE	FT .
	Inside	Outside (pier)
Initial Gate Closed	22/37	16/32
Gate Full Open	21/32	15/32
Final Gate Closed	21/32	16/32

RIGHT					
Inside	Outside (pier)				
20/32	18/32				
70/32	18/32				
20/32	18/32				

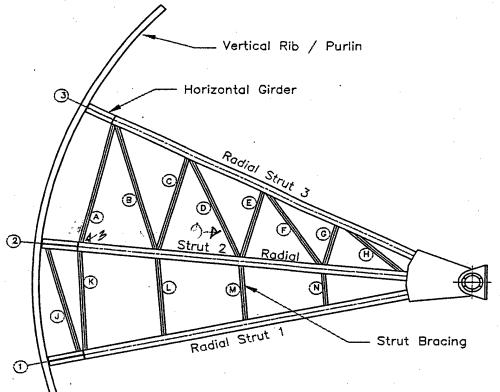
## 3-D Trunnion Hub Movements - Unloaded vs. Loaded

	LEFT					
	No	Load	Full Load			
	Voic	Dry	Void Full			
Vertical	+0.00	010	0,0085			
US / DS	0,00	$\infty$	+0.0230			
Transverse	21/32	16/32	72/32	16/32		
	Inside	Outside	Inside	Outside		

	RIGHT							
No l	_oad	Full Load						
Voic	Dry	Void Full						
0.00	200	-0,0020						
0,00	ಯ	to.03 <i>8</i> 0						
20/ /32	16/ /32	20/32	18/ 32					
Inside	Outside	Inside	Outside					

Inspection Team SMP TOB HAY Weather OVERCHST

Gate No. Left Elevation B-B



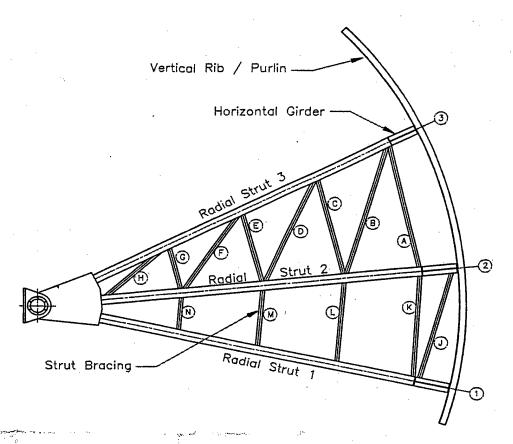
Member	Туре	e Depth d .		V	/eb	Flange(s)				
	1. [			t.,,			b <sub>f</sub>	t,		
	] [	Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured	
		(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	
Strut 3	14 WF 202	15 5/8	34	15/16		15 3/4	1	1 1/2	~	
Strut 2	14 WF 342	17 1/2	V .1	1 9/16		16 3/8	11/1/2	2 7/16		
Strut 1	14 WF 398	18 1/4	16116	1 13/16		16 5/8	10/2	_2 13/16	1/	
Brace A	14 WF 30	13 7/8		5/16		6 3/4	1	3/8	~	
Brace B	14 WF 30	13 7/8	<b>√</b> /	5/16	<b>9</b> 1.192.1-20.00.00.00.00.00.00.00.00.00.00.00.00.0	6 3/4	,	3/8	1/ .	
Brace C	14 WF 30	13 7/8	/	5/16		6 3/4		3/8	45/1	
Brace D	14 WF 30	13 7/8		5/16		6 3/4	1/2	3/8	7/	
Brace E	14 WF 30	13 7/8	6-1	5/16		6 3/4	1,7	3/8	1/	
Brace F	14 WF 30	13 7/8	1319/16	5/16		6 3/4		3/8	5/10	
Brace G	14 WF 30	13 7/8	13/5/16	5/16	~	6 3/4		3/8	Siin	
Brace H	14 WF 30	13 7/8	14	5/16		6 3/4	1/.	3/8	V.	
Brace J	14 WF 30	13 7/8	<b>Y</b>	5/16		6 3/4	16/19	3/8	5/16	
Brace K	14 WF 30	13 7/8	14	5/16		6 3/4	7	3/8		
Brace L	14 WF 30	13 7/8	V.	5/13		6 3/4		3/8	- Brown	
Brace M	. 14 WF 30	13 7/8	-\	5/16		6 3/4	\.	3/8	1	
Brace N	14 WF 30	13 7/8	177014	5/16	Significant -	6 3/4	1	3/8	1	

HDR Engineering, Inc.	
Corp of Engineers - Walla Walla	
Little Goose Dam	

Inspection Team SMP TOB HAY Weather

Date 17/1 Sheet 2

Gate No. \_\_\_\_\_ Right Elevation A-A



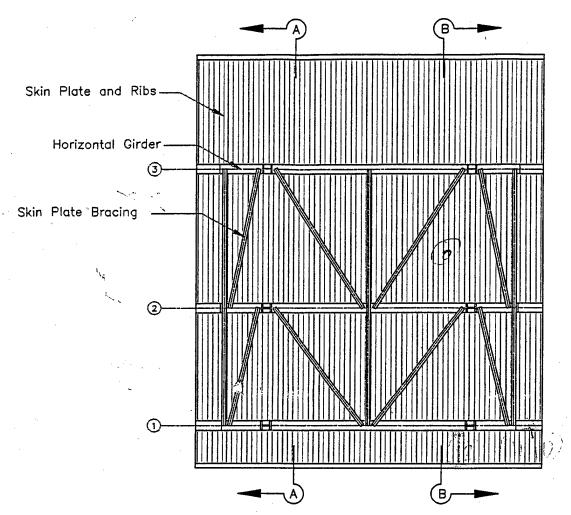
Member	⊸⊪Туре	Depth		V	Web		Flange(s)				
	-80°-24	d		t <sub>w</sub>			b <sub>f</sub>	t <sub>r</sub>			
45		Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured		
		(in)	(in)	(in)	(in)	(in)	(in)	(in)	(ip)		
Strut 3	14 WF 202	15 5/8	15/3/14	15/16		15 3/4	150/8	1 1/2			
Strut 2	14 WF 342	17 1/2	//~	1 9/16		16 3/8	16/4	2 7/16	11/1		
Strut 1	14 WF 398	18 1/4		1 13/16		16 5/8	1101/2	2 13/16			
Brace A	14 WF 30	13 7/8	W/	5/16		6 3/4	101/10	3/8	5/110		
Brace B	14 WF 30	13 7/8	V	5/16		6 3/4	47	. 3/8	5/2		
Brace C	14 WF 30	13 7/8	13/2/1/4	5/16		6 3/4 ,	1/2	3/8			
Brace D	14 WF 30	13 7/8	315/10	5/16		6 3/4	1/	3/8	5/12		
Brace E	14 WF 30	13 7/8	4	5/16		6 3/4		3/8	1/		
Brace F	14 WF 30	13 7/8	14	5/16		6 3/4	61197	3/8	5/110		
Brace G	14 WF 30	13 7/8	V.	5/16	<del></del>	6 3/4	~	3/8	577		
Brace H	14 WF 30	13 7/8	139/10	5/16	Name 100	6 3/4	1034	3/8	1100		
Brace J	14 WF 30	13 7/8		5/16	Andrewson and the second	6 3/4	Total	3/8	5/16		
Brace K	14 WF 30	13 7/8	V,	5/16		6 3/4	1/	3/8	5/110		
Brace L	14 WF 30	13 7/8	V /	5/16		6 3/4	10/90	3/8	9/10		
Brace M	14 WF 30	13 7/8	7	5/16		6 3/4			dus		
Brace N	14 WF 30	13 7/8	64	5/16	<del></del>	6 3/4	11/4	3/8	5/110.		

Inspection Team SMP TDB HAY Weather

Date 10/11 Sheet 3

Gate No.

**Downstream Elevation** 



$\underline{\hspace{1cm}}$	(20)	Leak	in w	ridel	(C. W)	KILN	anna	Vn	MANDA	ah
Member	Type	D	epth	1	Veb		Flange	- End	, .	1/1 1/6
			d		t <sub>w</sub>		b,	ţ,		1000
		Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured	
		(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	
Horiz. Girder 3	PL Girder	49 3/4		7/16	1	16	V	7/8	15/16	1
Horiz. Girder 2	PL Girder	60 1/2	100 40	3/4	3/	16 1/2		1 1/4	~	
Horiz. Girder 1	PL Girder	60 1/2	1/10 3/2	1		16 1/2	20	1 1/4	V	1
Purlins	ST 10 WF 31	10 1/2	<b>1</b>	13/32		8 1/4	10	5/8	1./_	1
Skin Plate Bracing	ST 7 WF 15	7	1134	1/4		6 3/4	*/	3/8		

(a) Strang divits in skin plate

(b) Strang (divits in skin plate

(c) Strang (divits in skin plate

(d) Strang (divite channed in the hours

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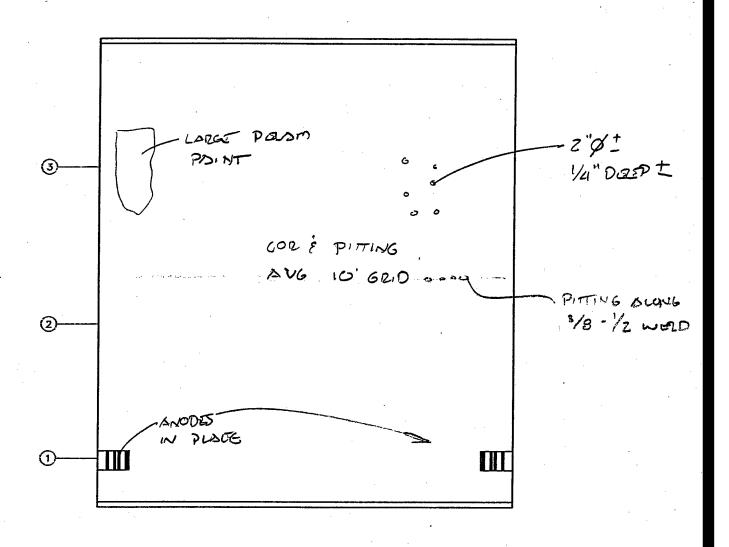
SUM PIANT

HDR Engineering, Inc.	
Corp of Engineers - Walla Walla	
Little Goose Dam	

Inspection Team SMP TDB HAY AMA
Weather CLDY 45

Date (0/18 Sheet 4

Gate No. Upstream Elevation



	DRAKE	POTOR	LOCKED	4	DOBNING	<u>e 25</u>	OPEN	40 min	CALBA
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		,							
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HDR Engineer			am SMP TDB HA	Y AMA	Date 10	/18/00
Corp of Engineers Little Goose Dam	- Walla Walla	Weat	Sheet	5		
Gate No.	6	Operation and	Trunnion Measur	omonte		
Cate No.		_Operation and	Trummon Measur	ements	•	
Racking Measu	rements: Botto	om of Gate and	Spillway			
u .		LEFT	RIGHT	1 .		
		41	41			•
				J .		4
Transverse Tru	nnion Hub Mov	ement, No Load	d on Gate: Close	d-Open-Closed		
	LE	FT	RIC	GHT	1	
	Inside	Outside	Inside	Outside		
·	21/	(pier)	16/	(pier)	<u>'</u>	
Initial Gate Closed	/ 54	17/32	16/32	21/32		
Gate Full Open	21/32	17/32	15/32	22/32		
Final Gate Closed	21/32	17/32	16/32	21/32		
``						
3-D Trunnion H	ub Movements	- Unloaded vs.	Loaded			
	LE	FT	RIC	<u> </u>	]	
	No Load	Full Load	No Load	Full Load		
	Void Dry	Void Full	Void Dry	Void Full	· •	
Vertical	0.0000	0,000	0,0000	0,0001		
US / DS	-0,0015	+0.0340	0.0000	+0,0450	1.	
Transverse	21/32 17/32	21/32 17/32	16/32 21/32	16/32 21/32		
	Inside Outside	Inside Outside	Inside Outside	Inside Outside		-
		•			ì	
-						
			·			<del></del>
		<del></del>	<del></del>	······································		· · · · · · · · · · · · · · · · · · ·

HDR	Eng	ineerii	ng,	Inc.
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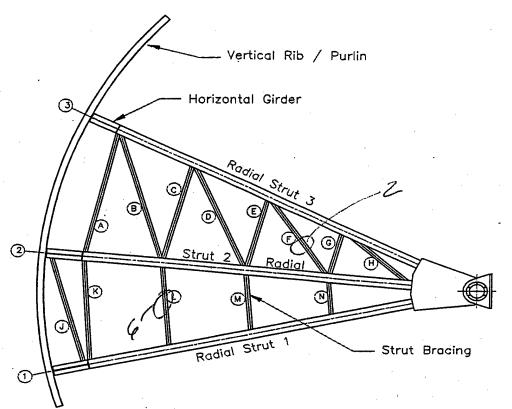
Inspection Team	SMP	TDB	)HAY	•
Weather <u>7</u>	ten			

WED. MORN.

Date 10/11/2000

Sheet 1

Gate No. 7
Left Elevation B-B



Member	Type		Depth	W	eb .		Flang	je(s)	
	1 1	d		t <sub>w</sub>		b <sub>f</sub>		t <sub>t</sub>	
	<b>+</b> [	Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured
		(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
Strut 3	14 WF 202	15 5/8	155/9	15/16		15 3/4	183/4	1 1/2	11/2
Strut 2	14 WF 342	17 1/2	1712	1 9/16		16 3/8	10/97	2 7/16 ·	27/1/
Strut 1	14 WF 398	18 1/4	185/14	1 13/16		16 5/8	110/2	2 13/16	23/4
Brace A	14 WF 30	13 7/8	137/6	5/16		6 3/4	6214	3/8	116
Brace B	14 WF 30	13 7/8	137/4.	5/16		6 3/4	(-136	3/8	>8
Brace C	14 WF 30	13 7/8	135116	5/16		6,3/4	10314	3/8	3/8
Brace D	14 WF 30	13 7/8	1315/16	5/16		6 3/4	6/3/16	3/8	1/4
Brace E	14 WF 30	13 7/8	1313/10	5/16		6 3/4	6 3/16	3/8	-1/3 1/5
Brace F	14 WF 30	13 7/8	137/0	5/16		6 3/4	103/4	3/8	5/0
Brace G	14 WF 30	13 7/8	137/8	5/16		6 3/4	6/3/10	3/8	3/8
Brace H	14 WF 30	13 7/8	137/8	5/16		6 3/4	6319	3/8	3/8
Brace J	14 WF 30	13 7/8	13 1/8	5/16		6 3/4	63/2/	3/8	40
Brace K	14 WF 30	13 7/8	1315/16	5/16		6 3/4	103/4	3/8	3/8
Brace L	14 WF 30	13 7/8	137/8	5/16		6 3/4	67/6,	3/8	3/03
Brace M	14 WF 30	13 7/8	13/18	5/16		6 3/4	63/4	3/8	2/0
Brace N	14 WF 30	13 7/8	1315/16	5/16		6 3/4	63/9	3/8	3/6

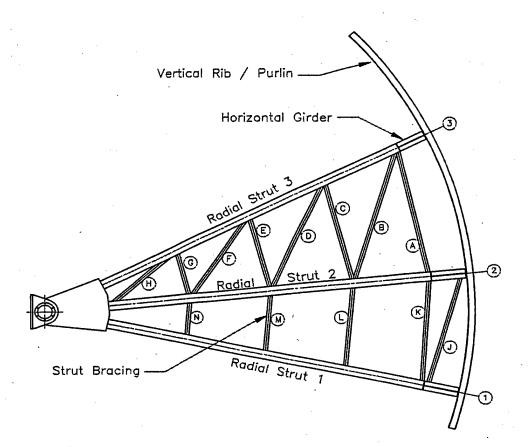
2. PEERED RUST @ DA F

Co. Troflection IN Flange Vert. "L" 2 14" Deflection

Inspection Team SMP TDB HAY
Weather

Date 10 / 11 Sheet 2

Gate No. 7
Right Elevation
A-A



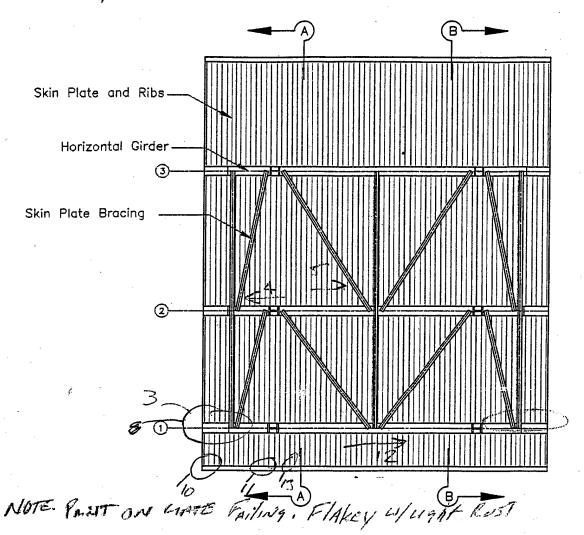
Member	Type		Depth		Web		Flange(s)			
		d		t.,		b <sub>f</sub>		4		
	1 [	Plan	Measured	Plan Measu	Measured	Plan	Measured	Plan	Measured	
		(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	
Strut 3	14 WF 202	15 5/8	155/8	15/16		15 3/4	1534	1 1/2	1/2	
Strut 2	14 WF 342	17 1/2	171/2.	1 9/16		16 3/8	160 /14	2 7/16	27/16	
Strut 1	14 WF 398	18 1/4	1894	1 13/16		16 5/8	161/2	2 13/16	2 3/10	
Brace A	14 WF 30	13 7/8	13/5/16	5/16		6 3/4	6 3/4	3/8	3/9	
Brace B	14 WF 30	13 7/8	13/5/16	5/16		6 3/4	63/16	3/8	3/0	
Brace C	14 WF 30	13 7/8	13 15/1	5/16		6 3/4	67/8	3/8	8/8	
Brace D	14 WF 30	13 7/8	14	5/16		6 3/4	63/4	3/8	3/8	
Brace E	14 WF 30	13 7/8	1513/16	5/16		6 3/4	6118	3/8	3/8	
Brace F	14 WF 30	13 7/8	137/8	5/16		6 3/4	10 3/4	3/8	3/8	
Brace G	14 WF 30	13 7/8	13/3/16	5/16		6 3/4	63/4	3/8	3/6	
Brace H	14 WF 30	13 7/8	1313/16	5/16		6 3/4	63/4	3/8	7/8	
Brace J	14 WF 30	13 7/8	1315/6	5/16		6 3/4	Co 13/16	3/8	1/93	
Brace K	14 WF 30	13 7/8	137/2	5/16		6 3/4	613/16	3/8	3/8	
Brace L	14 WF 30	13 7/8	13/5/16	5/16		6 3/4	63/4	3/8	3/8	
Brace M	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	644	3/8	3/8	
Brace N	14 WF 30	13 7/8	13718	5/16		6 3/4	60/4	3/8	1/8	

Inspection Team SMP TDB HAY
Weather

Date 10/11/2000 Sheet 3

Gate No.

Downstream Elevation



Member	Туре	D	epth	1	Web	Flange - End				
	·		d	t.,		b <sub>f</sub>		t <sub>r</sub>		
		Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured	
Ĺ.,		(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	
Horiz. Girder 3	PL Girder	49 3/4	4976	7/16	7/16	16	16	7/8		
Horiz. Girder 2	PL Girder	60 1/2	601/2	3/4	8/4	16 1/2	1101/2	1 1/4	15/16	
Horiz. Girder 1	PL Girder	60 1/2	1003/9	1	11/10	16 1/2	1612	1 1/4	15/16	
Purlins	ST 10 WF 31	10 1/2	1038	13/32	,	8 1/4	83/16	5/8	5/8	
Skin Plate Bracing	ST 7 WF 15	7	7	1/4	1/4	6 3/4	63/11	3/8	3/8	

3. LEAK INS SIDE SEAL ON SAMOING BY IN BAT. G. REEK

5. Looking left NOTE light list on All Members

3. Standardy 420 ON Bot hickner

10. Sine SEA! LEAK WY Light RUST AND Min Deposit

11. Bottom PH. Full of the O'WI muck

12. Alarg Bot Liane Light Rust on All Markers

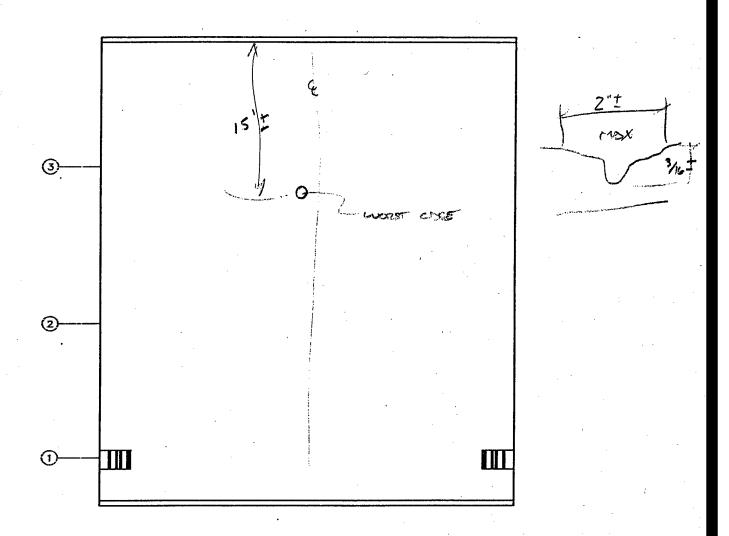
13. MODERATE PUST ON PURLIN Web DUE TO SHANDING MED

4. Moderate RET ON BRACE PHS.

HDR Engineering, Inc.	Inspection TeamSMP_TDB/HAY	Dat
Corp of Engineers - Walla Walla	Weather	She
Little Goose Dam		<del>-</del>

Date 10/11/2222

Gate No. 1 Upstream Elevation



MUCH RUTTER	CONDITION	THON GI	BNITE			
FUDENCE	OF POST	was E	6RIND			· · · · · · · · · · · · · · · · · · ·
				<del></del>		
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	-					

HDR Engineering, In	c.
Corp of Engineers - Walla	
Little Goose Dam	

Inspection Team	SMP	TDB	HAY	AMA
Weather				

Date	10/	17	100	
Sheet -		5		

Gate No.

7

**Operation and Trunnion Measurements** 

Racking Measurements: Bottom of Gate and Spillway

ı	LEFT
	38/2

RIGHT	
39	

Transverse Trunnion Hub Movement, No Load on Gate: Closed-Open-Closed

,	LEFT		
	Inside	Outside (pier)	
Initial Gate Closed	23/32	21/32	
Gate Full Open	24/32	23/32	
Final Gate Closed	23/32	21/32	

	RIGHT		
	Inside	Outside (pier)	
1	< ,		
	5/32	23/32	
14	1/32	24/32	
	5/32	23/32	

#### 3-D Trunnion Hub Movements - Unloaded vs. Loaded

		LEFT		
	No	Load	Full	Load
	Voic	Dry	Voic	l Full
Vertical	+0.0	02	-O,5	025
US / DS	+0,0	+0,0005		37
Transverse	23/32	20/32	23/	21/32
	inside	inside Outside		Outside

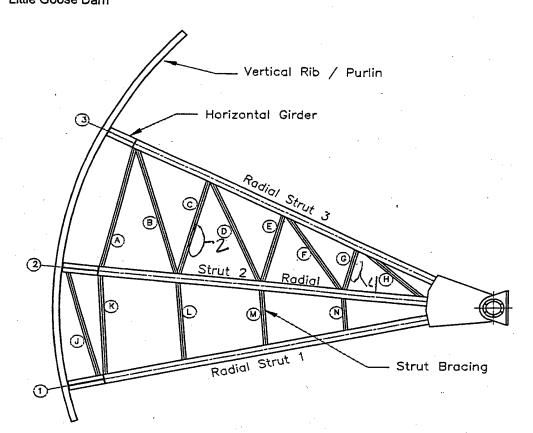
RIGHT			
No Load		Full Load	
Void Dry		Voic	i Full
-0.0	201	-0,0	512
ين. ت	<b>20</b>	+0.0	300
15/32	23/32	16/32	<sup>22</sup> / <sub>32</sub>
Inside	Outside	Inside	Outside

•
•
•

HDR Engineering, Inc.
Corp of Engineers - Walla Walla
Little Googe Dam

Inspection Team	SMP (TDB1/	<b>ΔΥ</b>
Weather	SUNNY	65

Date 10/10
Sheet 1



Gate No. 8

Member	Туре	Depth		W	/eb		Flan	ge(s)	
			ď	1	. t., [		b,		t,
1		Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured
		(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
Strut 3	14 WF 202	15 5/8	157/92	15/16		15 3/4	153/4	1 1/2	17/16
Strut 2	14 WF 342	17 1/2	171/2	1 9/16		16 3/8	163/10	2 7/16	2 1/2
Strut 1	14 WF 398	18 1/4	181/0	1 13/16		16 5/8	163/6	2 13/16	213/16
Brace A	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	673/10	g · 3/8	3/6
Brace B	14 WF 30	13 7/8	135/1/2	5/16		6 3/4	103/9	3/8	3/60
Brace C	14 WF 30	13 7/8	137/8	5/16		6 3/4	63/11	3/8	3/2
Brace D	14 WF 30	13 7/8	13/10	5/16		6 3/4	6/3/16	3/8	3/8
Brace E	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	63/16	3/8	2/0
Brace F	14 WF 30	13 7/8	137/6	5/16		6 3/4	10 3/4	3/8	2/g 3/8
Brace G	14 WF 30	13 7/8	1315/16	5/16		6 3/4	613/10	3/8	3 Jack
Brace H	14 WF 30	13 7/8	1376	5/16		6 3/4	63/c	3/8	1/8
Brace J	14 WF 30	13 7/8	137/6	5/16		6 3/4	(03/L	3/8	3/6
Brace K	14 WF 30	13 7/8	13/5/10	5/16		6 3/4	612/10	3/8	78
Brace L	14 WF 30	13 7/8	133/4	5/16		6 3/4	107/8	3/8	36
Brace M	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	63/4	3/8	¥0
Brace N	14 WF 30	13 7/8	13 15/14	5/16		6 3/4	67/4	3/8	15

2. Light Rust on Vert Bec. "C"

3. Light Flaker Durt and Diagonal "D"

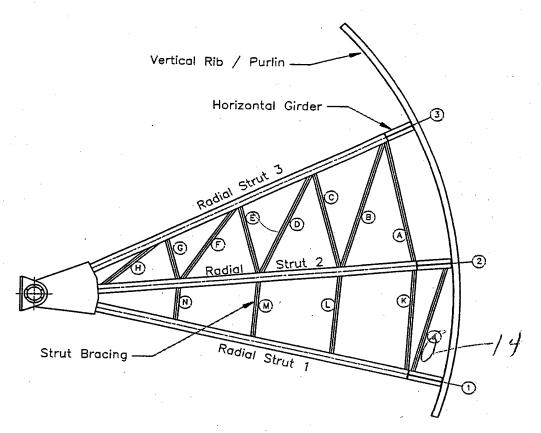
4. Light list COATING Flaking Anny

5. Over All Pic of LEFT Strots Light Bust & Delan COAtinh

Inspection Team SMP (TDB HAY Weather

Date 10/10 Sheet 2

Gate No. <u>§</u>
Right Elevation
A-A



Member	Type	Depth		Type Depth Web			Flange(s)			
·	1 1		d		tw		b,	3 - (-)	t,	
	1 1	Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured	
0		(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	
Strut 3	14 WF 202	15 5/8	15 7/8	15/16		15 3/4	153/4	1 1/2	17/16	
Strut 2	14 WF 342	17 1/2	171/2	1 9/16		16 3/8	16 3/16	2 7/16	27/16	
Strut 1	14 WF 398	18 1/4	181/4	1 13/16	<del> </del>	16 5/8	1/ 1/-	2 13/16		
Brace A	14 WF 30	13 7/8	13/5/16	5/16		6 3/4	63/4	3/8	2/18 3/8	
Brace B	14 WF 30	13 7/8	13 15/11	5/16	<b></b>	6 3/4	7 10 7		7/8	
Brace C	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	(0 13//6	3/8	3/0	
Brace D	14 WF 30	13 7/8	3 15/110	5/16		6 3/4	63/4	3/8	1/6	
Brace E	14 WF 30	13 7/8	13 15/11	5/16	<u>;</u>	6 3/4		3/8	1/8	
Brace F	14 WF 30	13 7/8	13/5/16	5/16		6 3/4	103/4	3/8	19	
Brace G	14 WF 30	13 7/8	13 15/110	5/16		6 3/4	1.7/4	3/8	1/8	
Brace H	14 WF 30	13 7/8	137/8	5/16		6 3/4	6 = 14	3/8 3/8	3/0	
Brace J	14 WF 30	13 7/8	37/8	5/16		6 3/4	Ce 3/4	3/8	3/8	
Brace K	14 WF 30	13 7/8	137/8	5/16		6 3/4	63/4	3/8		
Brace L	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	103/4	3/8	3/6	
Brace M	14 WF 30	13 7/8	13 15/16	5/16		6 3/4	3/4	3/8	3/8	
Brace N	14 WF 30	13 7/8	13 15/10	5/16		6 3/4	63/4	3/8	3/8	

14 Typ Orlan	novade		•	
5.16 Galer on	2nd Stept Fram Deni	UI Abak		
		404 17		· · · · · · · · · · · · · · · · · · ·

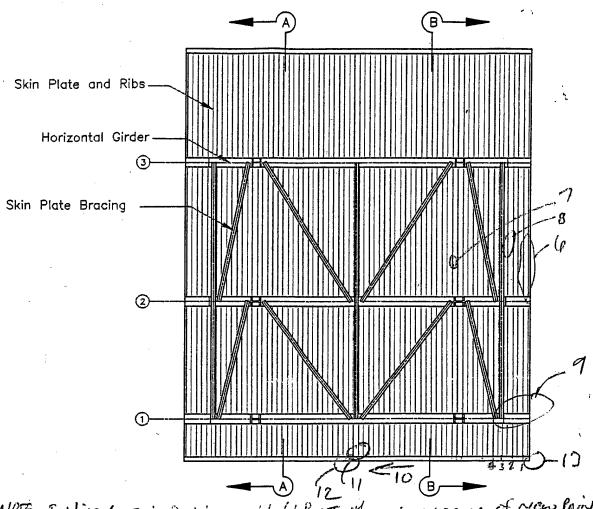
HDR Engineering, Inc.
Corp of Engineers - Walla Walla
Little Goose Dam

Inspection Team SMP (DB HAY Weather

Date 10/10
Sheet 3

Gate No.

8 Downstream Elevation



NOTE. ENTILE GATE is Penling w/ light Rust, there is evidence of New Paint O.V.

Member	Type	Depth			Web		Flange	- End	
			d		t <sub>w</sub>		b <sub>f</sub>	ţ,	
		Plan	Measured	Plan	Measured	Plan	Measured	Plan	Measured
		(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
Horiz. Girder 3	PL Girder	49 3/4	49314	7/16	7/16	16	160	7/8	7/8
Horiz. Girder 2	PL Girder	60 1/2	10/12	3/4	3/4	16 1/2	16/2	1 1/4	1/4
Horiz. Girder 1	PL Girder	60 1/2	(00 3/9)	1	11/4	16 1/2	167/16	1 1/4	1 44
Purlins	ST 10 WF 31	10 1/2	101/2	13/32	7,4	8 1/4	814	5/8	9/16
Skin Plate Bracing	ST 7 WF 15	7	7	1/4	1/4	6 3/4	63/4	3/8	3/4,

10. FARLEFT PURLIN MINISTRAL DEPOSITS & Light Rust.

7. Puglial Web Bert.

8. GRINDING MALICS AROUND WELDS (THE)

9. Brace PHS W/Debris and evidence of StNDING H20

10 Along Bot SPAI

11. Muck @ Bot. Plt.

12, took & center of rate

13 leak & LEFT COUNTY

Onto PHO HAVE BEEN  SING PHO HAVE BEEN  LEMPTS SHOWN PHTS ARE CALL  COMMENT PHTS HAVE BEEN  LEMPTS SHOWN PER  LEMPTS SHOWN PER  LEMPTS SHOWN PER  LEMPTS ARE CALL  LEMPTS LOOK AREA  LEMPTS LOOK AREA  LEMPTS LOOK AREA  LEMPTS LOOK AREA				
ONE PHO HAVE BEEN  TEMPOS SHOWN DE RY  MALL PITTS	SEO	WELDED	(Abge	YKVO
ONE PITS HAVE BEEN  FEMILEDS SHOWD BE RE  FINER PITS ALE EXI  L'AMALL PITTS		4		
ONA PITS HAVE BEEN PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXILEMAND PITS ALE EXIL				WATERLINE
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'SING PITS HAVE BEEN PEUREDS SHOULD BE RE PITS ARE EX				FHELDED GOT.
'SING PITS HAVE BEEN · FELDEDS SHOULD BE RE · IPHER PITS ARE EX		<b>\$</b>		- MICHINA
MALL PITTS ALL EX				
MALL PITTS ALL EXI			DM	ATERIA7

HDR Engineering, Inc.	
Corp of Engineers - Walla Wa	lla
Little Goose Dam	

Inspection Team	SMP	TDB	HAY	AMA	
Weather	OVER	CAST	50		

Date	10/10	100
Sheet	5	

Gate	No.
Juli	110.

**Operation and Trunnion Measurements** 

Racking Measurements: Bottom of Gate and Spillway

LEFT	
45"	

RIGHT	
45"	

Transverse Trunnion Hub Movement, No Load on Gate: Closed-Open-Closed

ſ	LE	FT
•	Inside	Outside (pier)
Initial Gate Closed	24/32	14/32
Gate Full Open	<sup>2</sup> 3/ <sub>32</sub>	16/32
Final Gate Closed	23/32	15/32

RIGHT		
Inside Outside (pier)		
16/32	19/32	
15/32	19/32	
16/32	19/32	

#### 3-D Trunnion Hub Movements - Unloaded vs. Loaded

	LEFT					
	No I	No Load		No Load Full Load		Load
	Voic	Void Dry		Full		
Vertical	†0.000B		+0:0003			
US / DS	+0,0020		+0.0	3   5		
Transverse	23/32	15/32	23/32	14/3z		
	Inside	Outside	Inside	Outside		

RIGHT				
No L	.oad	Full Load		
Void Dry		Void Full		
0.00	00	0	010	
+0.0	0	+0.0250		
16/32	19/32	16/32	19/32	
Inside	Outside	Inside	Outside	

			·
			•
			:
`			
	·		

### Inspection Team K & N Weather RAIN

Date 10/10/00 Sheet 1 OF 1

Gate No. 1

**Hoist Amperage Readings** 

Name Plate Data	REULAND		
Horsepower	15		
Voltage	440/3 PHASE/60 HZ	DESIGN C	
Current	19.00	1760 RPM	
Туре	A000		
Frame	284U		

Loaded

Amperage		Loa	ıded	Unlo	aded
		Opening	Closing	Opening	Closing
	Starting	89.6	84.0	87.6	72.0
ng	Phase A	11.8	6.7	10.9	6.6
Running	Phase B	12.1	6.4	10.8	6.4
L 22	Phase C	<sup>,</sup> 11.8	6.7	10.7	6.6
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HDR Engineering, Inc.
Corp of Engineers - Walla Walla
Little Goose Dam

Inspection Team K&N
Weather RAIN

Date 10/10/00 Sheet 1 OF 1

Gate No. 2

Name Plate Data	REULAND		
Horsepower	15		
Voltage	440/3 PHASE/60 HZ	DESIGN C	
Current	19.00	1760 RPM	
Туре	A000		
Frame	284U		

Amperage		Loaded		Unloaded	
		Opening	Closing	Opening	Closing
	Starting	103.0	93.6	92.8	81.6
ng	Phase A	12.1	6.8	10.9	6.7
Running	Phase B	12.0	6.7	10.8	6.4
L <sub>R</sub>	Phase C	′ 12.0	6.8	10.8	6.8

BEARING NOISE IN MOTOR	
	N

HDR Engineering, Inc.	
Corp of Engineers - Walla Walla	ĉ
Little Goose Dam	

Inspection Team K & N
Weather RAIN

Date 10/10/00 Sheet 1 OF 1

Gate	No.	3

Name Plate Data	REULAND				
Horsepower	15				
Voltage	440/3 PHASE/60 HZ	DESIGN C			
Current	19.00	1760 RPM			
Туре	A000				
Frame	284U ·				

Amperage		Loa	ded	Unloaded		
	- Importing	Opening	Closing	Opening	Closing	
	Starting	101.0	94.0	96.0	85.6	
ng	Phase A	10.8	6.3	10.9	6.4	
Running	Phase B	12.0	6.4	11.1	5.9	
2	Phase C	12.0	6.4	10.7	6.3	

BAD TAPE ON MOTOR LEAD WIRES	
HEATER WIRES FRAYED	
,	

Inspection Team K & N
Weather RAIN

Date 10/10/00 Sheet 1 OF 1

Gate No. 5

Name Plate Data	REULAND	
Horsepower	15	
Voltage	440/3 PHASE/60 HZ	DESIGN C
Current	19.00	1760 RPM
Туре	A000	
Frame	284U	

Amperage		Loa	ded	Unloaded		
		Opening	Closing	Opening	Closing	
	Starting	93.0	88.0	84.8	78.0	
ng	Phase A	12.3	6.0	11.6	6.2	
Running	Phase B	12.4	6.2	11.6	6.3	
<b>K</b>	Phase C	12.5	6.2	11.6	6.2	

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4					

### Inspection Team K & N Weather CLOUDY/DAMP

Date 10/10/00 Sheet 1 OF 1

Gate No. 6

Name Plate Data	GE	
Horsepower	15	
Voltage	460/3 PHASE/60 HZ	DESIGN B
Current	19.20	1760 RPM
Туре	5KW254SE205C	······································
Frame	254T	

Amperage		Loa	ded	Unloaded		
		Opening	Closing	Opening	Closing	
	Starting	104.0	99.2	99.2	80.0	
βū	Phase A	13.7	7.6	13.3	6.6	
Running	Phase B	13.6	7.4	13.6	6.4	
αŽ	Phase C	13.4	7.4	13.4	6.5	

ADJUSTED BARKE UNIT			
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## Inspection Team K & N Weather 60' WARM DAY

Date 10/17/00 Sheet 1 OF 1

Gate No. 7

Name Plate Data	a REULAND		
Horsepower	15		
Voltage	440/3 PHASE/60 HZ	DESIGN C	
Current	19.00	1760 RPM	
Туре	A000		
Frame	284U		

Amperage		Loaded		Unloaded	
		Opening	Closing	Opening	Closing
	Starting	11.5	86.0	102.0	80.0
gu	Phase A	11.8	6.7	12.2	6.1
Running	Phase B	11.6	6.1	11.4	6.2
æ	Phase C	9.2	6.3	11.5	6.1

MOTOR BEAR	INGS GONE	
·		

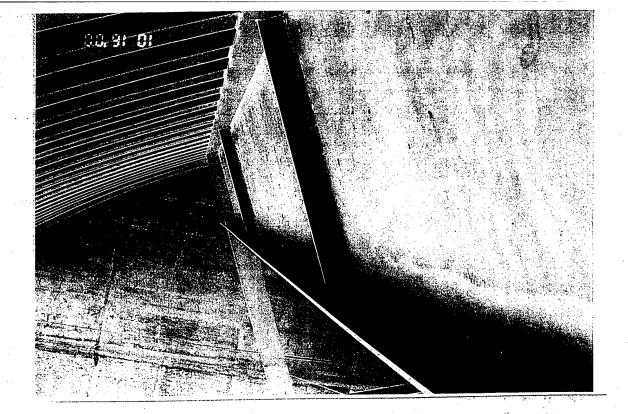
Inspection Team K & N
Weather DAMP

Date 10/10/00 Sheet 1 OF 1

Gate No.	8
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Name Plate Data	REULAND		
Horsepower	15		
Voltage	440/3 PHASE/60 HZ	DESIGN C	
Current	19.00	1760 RPM	
Туре	A000		
Frame	284U		

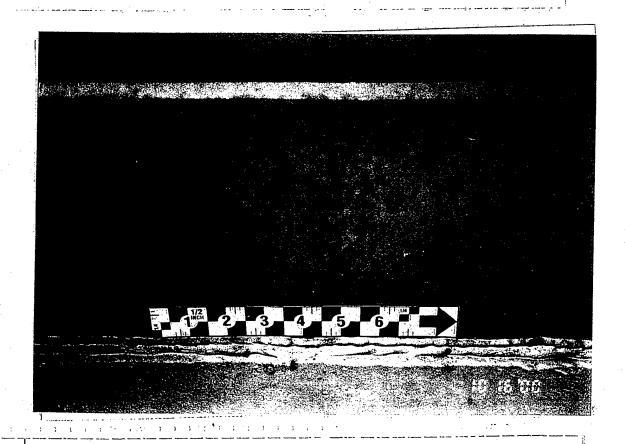
Amperage		Loaded		Unloaded	
		Opening	Closing	Opening	Closing
	Starting	95.2	84.0	84.0	74.0
gu	Phase A	11.8	5.8	12.2	6.4
Running	Phase B	10.8	5.5	12.0	6.3
R	Phase C	11.0	5.7	11.8	6.3
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Gate 1
Top horizontal girder looking toward right frame, typical.

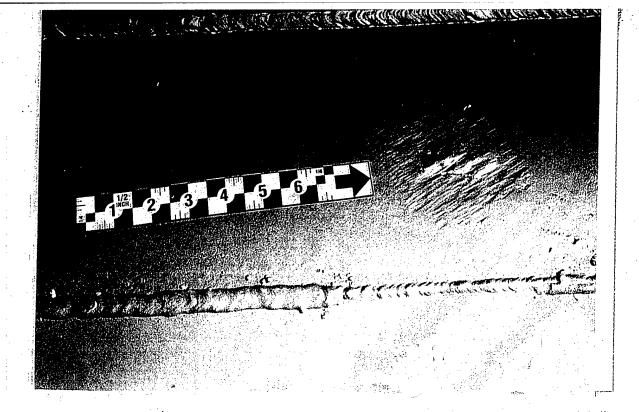
10/16/00

1-1



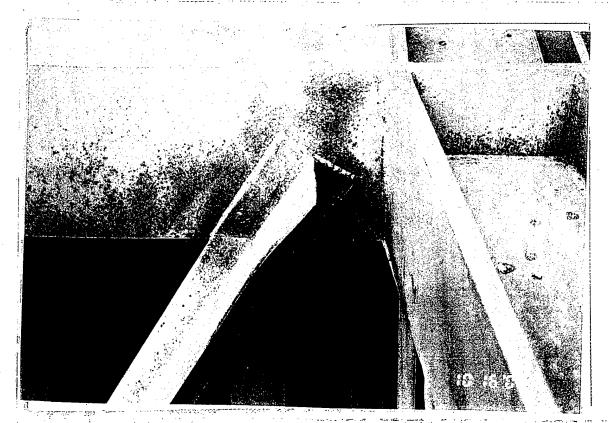
Little Goose Dam Gate 1
Downstream surface of skin plate.
Light corrosion, typical.

10/16/00

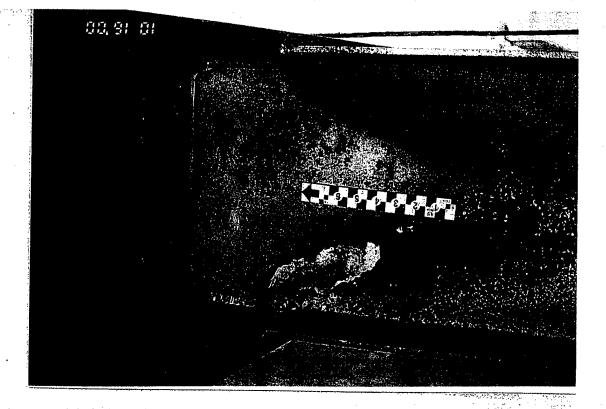


Gate 1 Skin plate at center of gate, 5' above top horizontal girder. Apparent previous weld and grind repair.

1-3

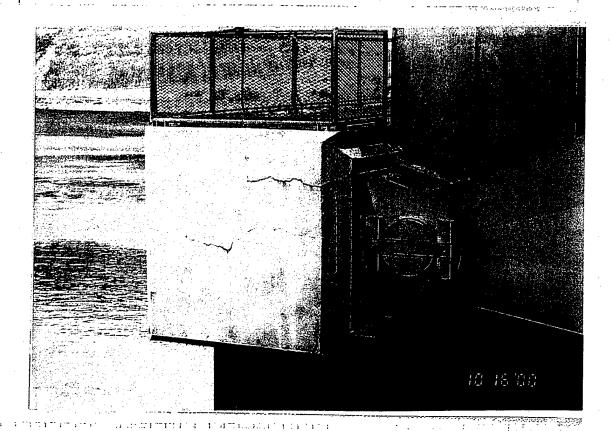


Little Goose Dam 10/16/00 Gate 1
Top horizontal girder, downstream flange at connection to left top radial strut. Light corrosion.



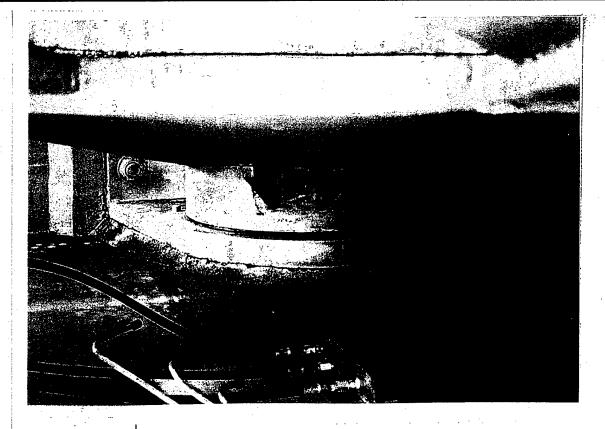
Gate 1 Left frame, brace C. Light corrosion beneath connection to top radial strut

1-5



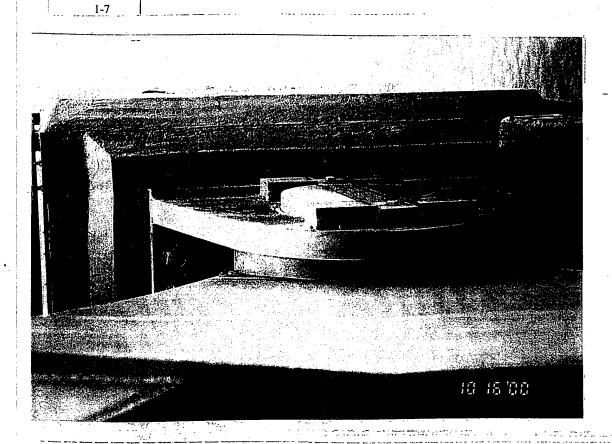
Little Goose Dam Gate 1
Right trunnion block. Light cracking in concrete.

10/16/00



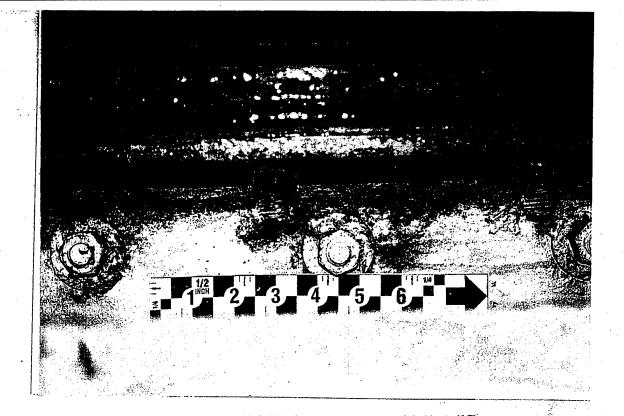
10/16/00

Gate 1 Outside of left trunnion and trunnion yoke, typical.



Little Goose Dam Gate 1 Inside of left trunnion and yoke, typical.

10/16/00



10/16/00

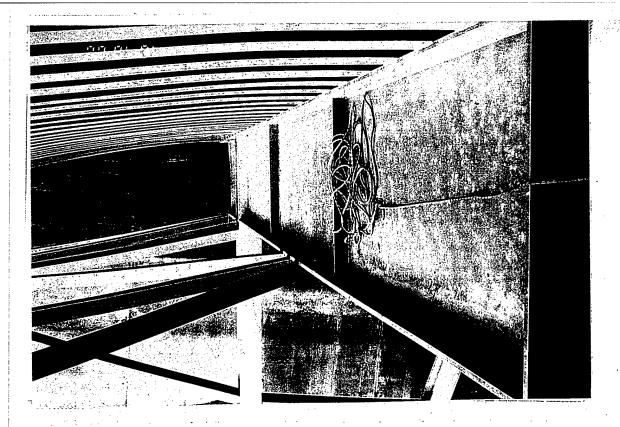
Gate 1
Side seal, typical. Light to moderate corrosion on skin plate, side seal angle, nuts and bolts.



Little Goose Dam

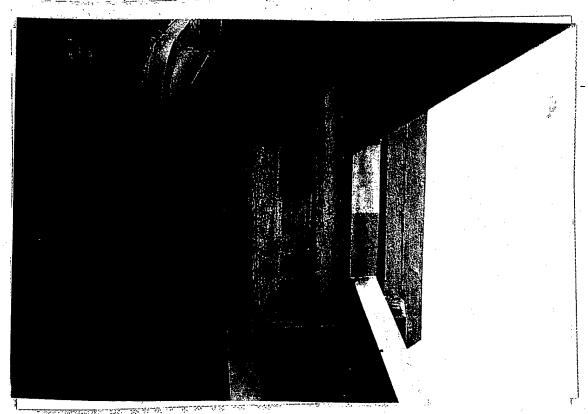
10/16/00

Gate 1
Side seal, typical. Light to moderate corrosion on skin plate, side seal angle, nuts and bolts.



Gate 1 Middle horizontal girder looking toward right frame, typical.

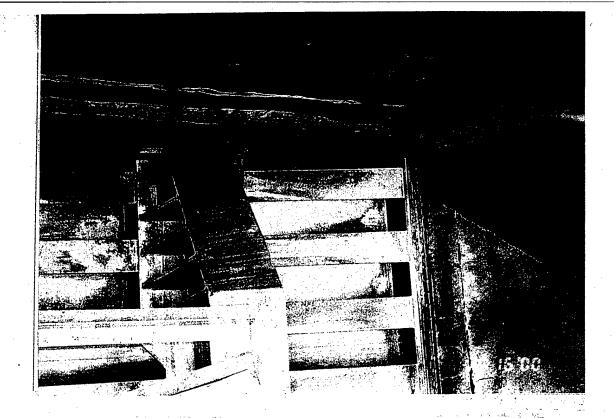
10/16/00



Little Goose Dam

Gate 1 Closure plate inside left trunnion. Light corrosion.

10/16/00



Goose Dam

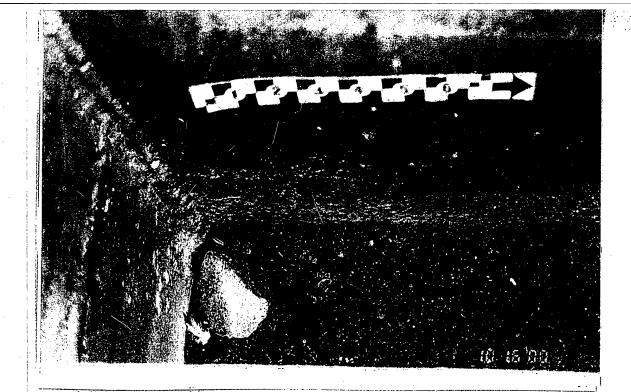
oose Corner leak at bottom left side of gate.

Gate 1

1-13

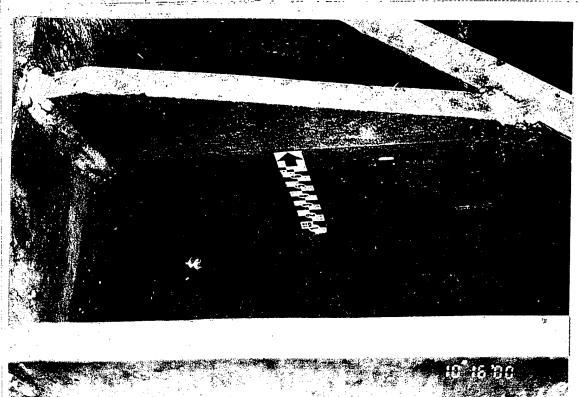


Little Goose Dam 10/16/00 Gate 1
Bottom seal closure plate looking upstream. Standing water between closure plate, purlin webs and skinplate. Typical.



Gate 1 Bottom horiz, girder. Standing water, no drainage between multiple stiffeners, typical.

1-15



Little Goose Dam Gate 1
Bottom horiz. girder. Standing water, no drainage between multiple stiffeners, typical.

1 16

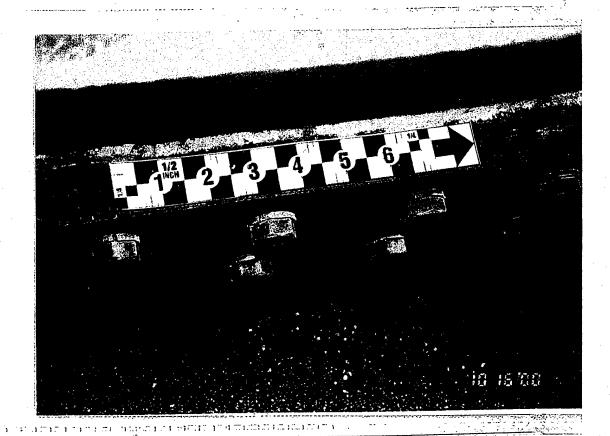
10/16/00

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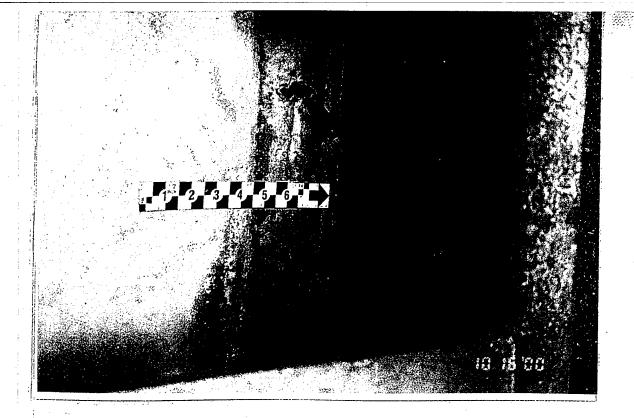
Gate 1
Bottom seal closure plate looking upstream. Standing water between closure plate, purlin webs and skinplate. Typical.

1-17



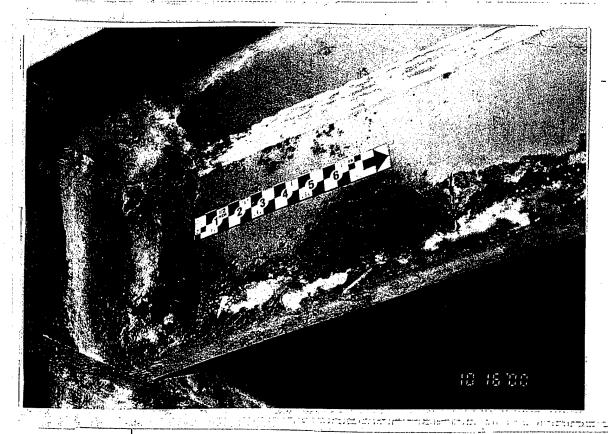
Little Goose Dam Gate 1
Bottom seal keeper plate and embedded bottom seal plate, typical.

10/16/00



Gate 1
Bottom seal closure plate looking upstream. Standing water between closure plate, purlin webs and skinplate. Typical.

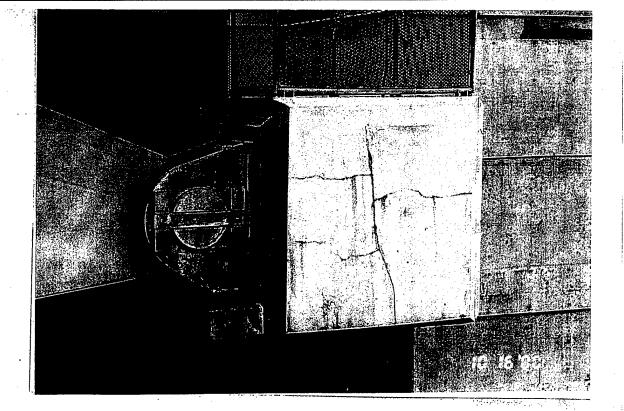
1-19



Little Goose Dam

10/16/00

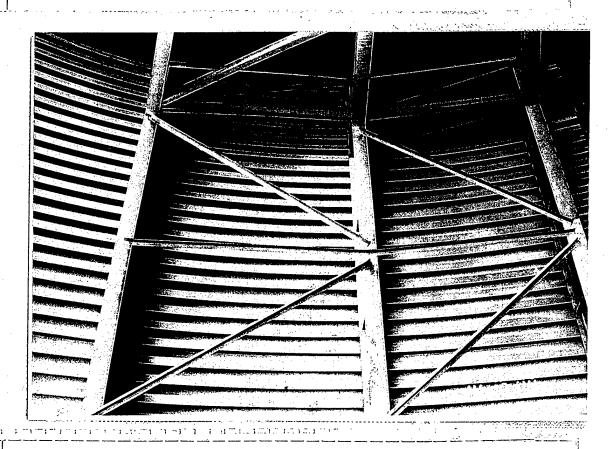
Gate 1
Bottom of bottom horizontal girder at stiffeners for bottom left radial strut. Light to moderate corrosion due to horiz. girder drain hole above.



Gate 1 Left trunnion block. Light cracking in concrete.

10/16/00

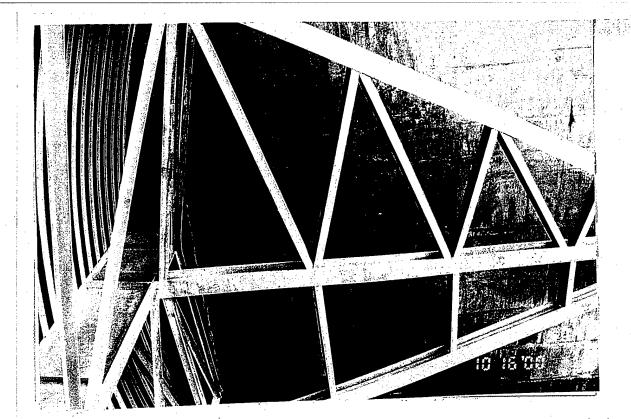
1-21



Little Goose Dam

Gate 1.
Gate face, typical.

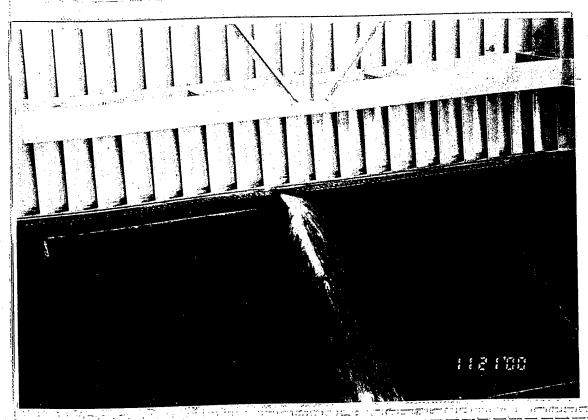
10/16/00



Gate 1 Left frame, typical.

10/16/00

1-23



Little Goose Dam Gate 1 Leak at center construction joint in spillway monolith.

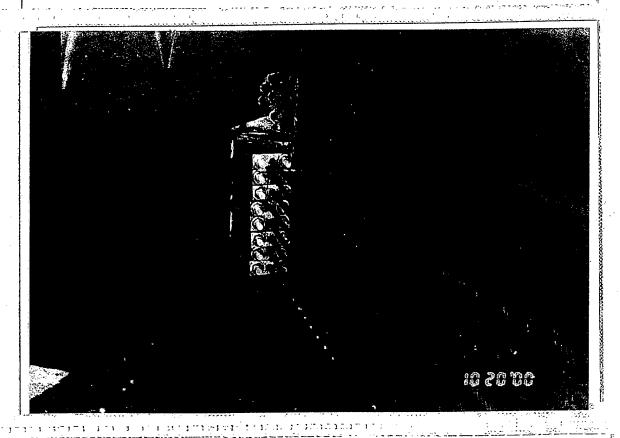
11/21/00



Little Goose Dam 10/20/00

Gate 1 Typical condition of skin plate. Scattered pitting.

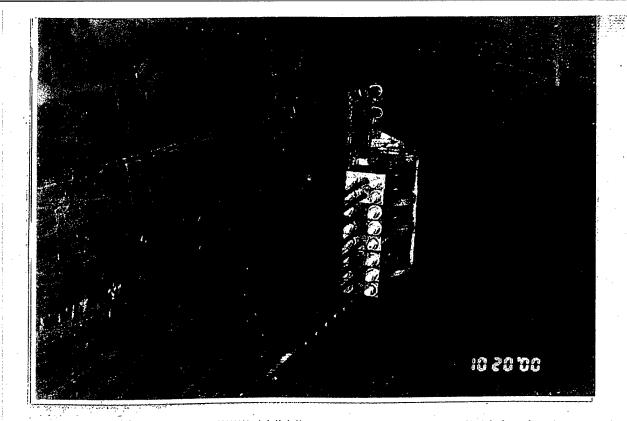
1-25



Little Goose Dam

Gate 1
Top of hoist connection. Note:
Good condition of stainless steel Ubolts and socket blocks.

10/20/00



Gate 1
Top of hoist connection. Note:
Good condition of stainless steel Ubolts and socket blocks.

10/20/00

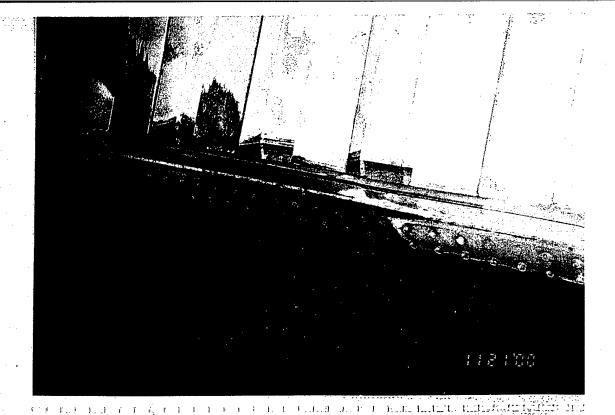
1-27



Little Goose Dam

Gate 1 Skin plate pitting, typical.

10/20/00



10/20/00

1-29

Gate 1
Bottom of right side of gate at 3' open. Note: Heavy falling water due to stop log leakage precludes inspection of hoist connections.

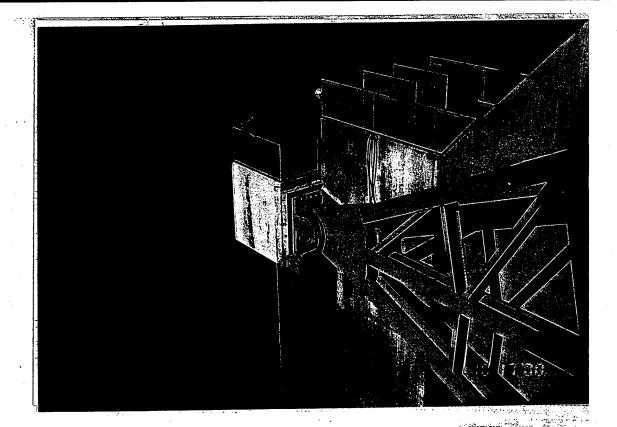


Little Goose Dam

10/20/00

Gate 1

Bottom of left side of gate at 3' open. Note: Heavy falling water due to stop log leakage precludes inspection of hoist connections.



10/17/00

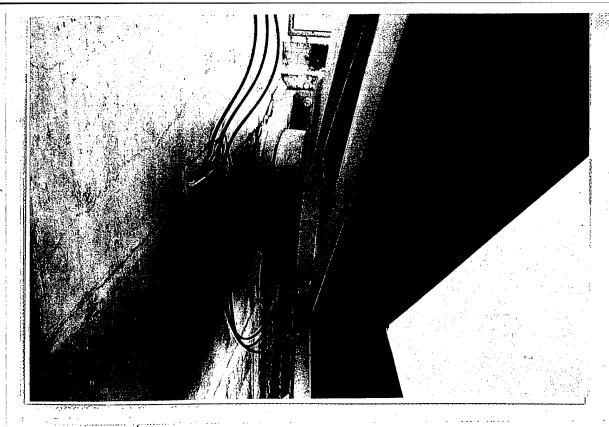
2-1

Gate 2 Right frame, typical.



Little Goose Dam Gate 2
Top of top horizontal girder looking towards right frame, typical.

10/17/00



Gate 2
Outside of left trunnion and yoke, typical.

10/17/00



Little Goose Dam Gate 2
Right trunnion and trunnion block, typical.

10/17/00



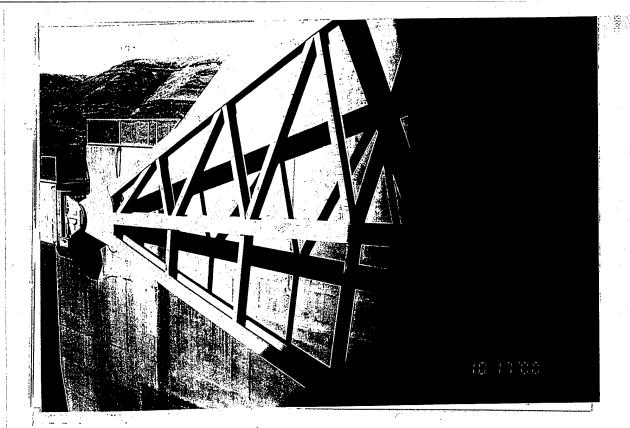
Gate 2
Bottom horizontal girder, left end.
Standing water, no drainage between multiple stiffeners, typical.

2-5



Little Goose Dam Gate 2 Side seal leak, right end of bottom horizontal girder.

10/17/00



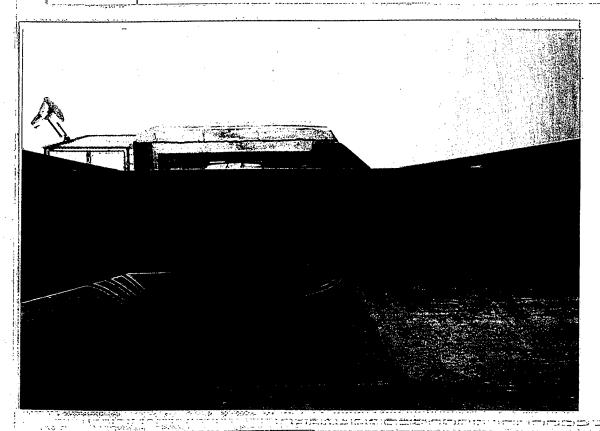
Little Goose

Dam

10/17/00

2-7

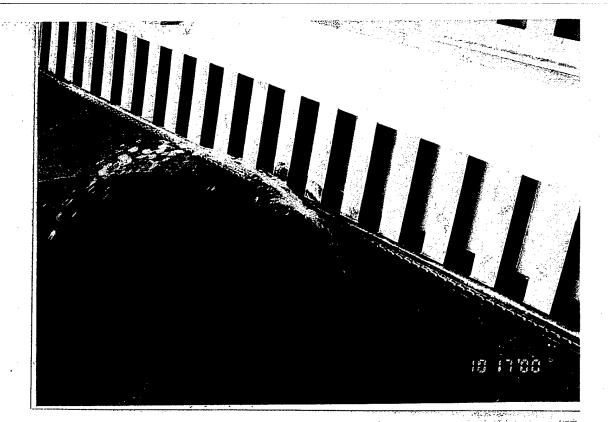
Gate 2 Right frame, typical.



Little Goose Dam

Gate 2
Brace H, left frame. Light corrosion on web.

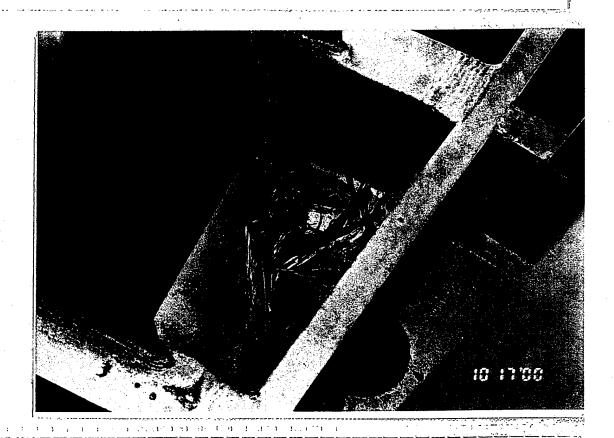
10/17/00



10/17/00

2-9

Gate 2 Leak at center construction joint in spillway monolith.



Little Goose Dam 10/17/00 Gate 2
Left frame between brace J and K.
Debris at upstream end of bottom
radial strut.



Gate 2
Bottom horizontal girder, left end.
Standing water, no drainage between
multiple stiffeners, typical.

2-11



Little Goose Dam Gate 2
Bottom horizontal girder, Right end.
Standing water, no drainage between
multiple stiffeners, typical.

10/17/00



Gate 2 Left frame, typical.

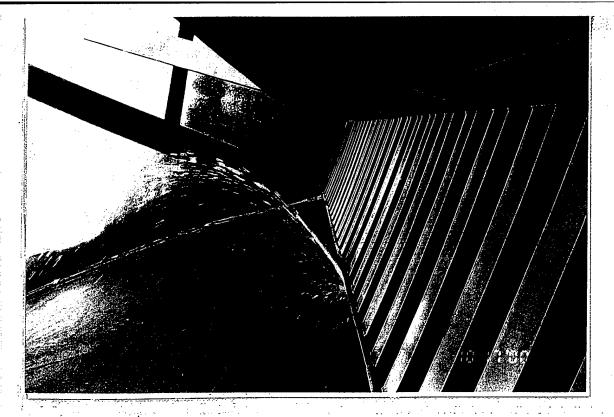
2-13



Little Goose Dam

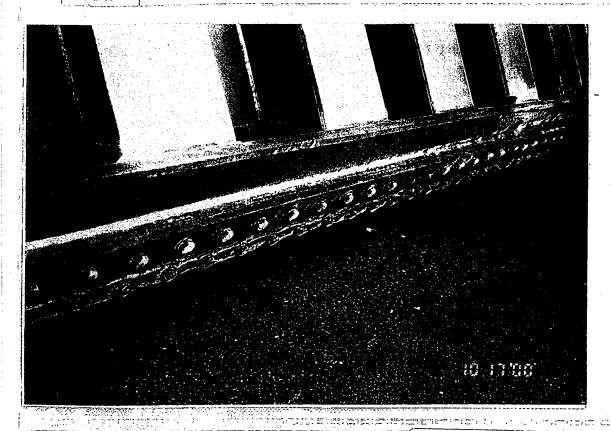
10/17/00

Gate 2
Leak, bottom left corner of gate.
Bottom seal closure plate. Standing water between closure plate, purlin webs and skinplate. Typical.



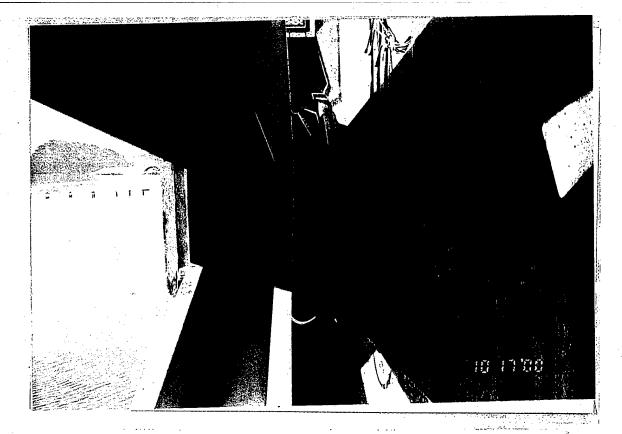
Gate 2 Leak at center construction joint in spillway monolith.





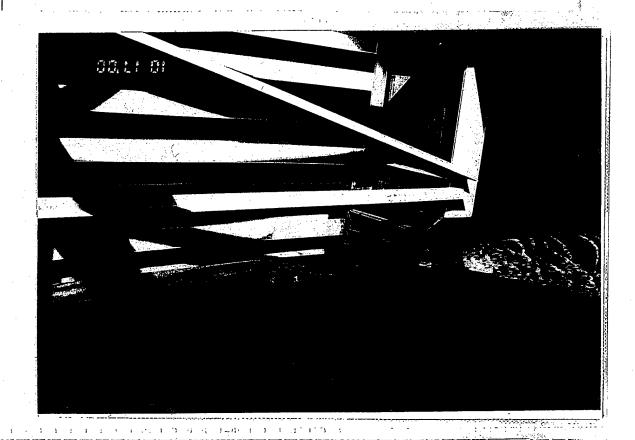
Little Goose

Goose Dam 10/17/00 Gate 2
Bottom seal keeper plate, light corrosion. Embedded bottom seal plate, typical.



2-17

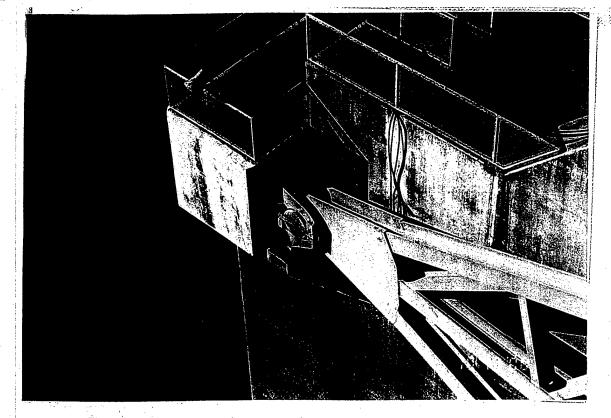
Gate 2
Inside closure plate at right trunnion.
Light corrosion and staining from drain hole above.



Little Goose Dam

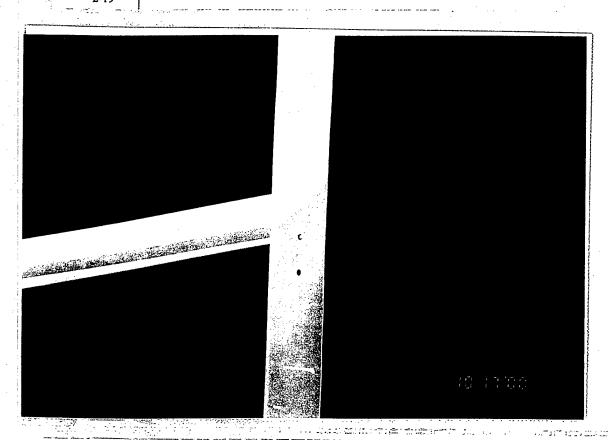
10/17/00

Gate 2
Side seal leak, right side of gate.



Gate 2
Right trunnion block, typical.

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Little Goose Dam

Gate 2 Extraneous holes, top plate at purlins.

10/17/00



Gate 2 Bottom seal keeper plate, typical.

2-21



Little Goose Dam Gate 2
Bottom seal, typical.

10/20/00



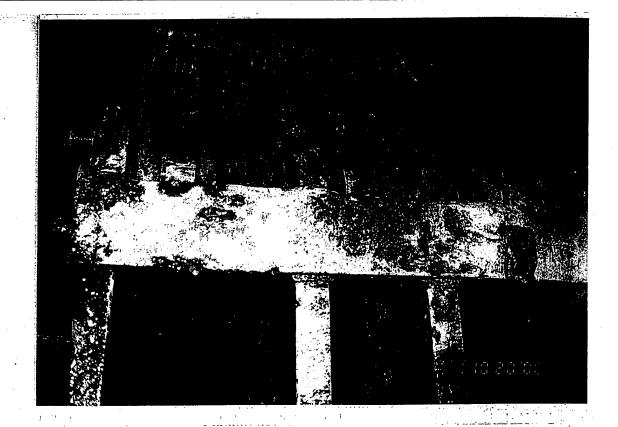
Gate 2 Right hoist connection and zinc anodes. Light corrosion on lifting lugs.

2-23



Little Goose Dam Gate 2
Zinc anodes, good condition.

10/20/00



Gate 2
Bottom of hoist connection. Light corrosion on plates.

2-25



Little Goose Dam Gate 2
Unidentified metal clamp near hoist connection.

10/20/00



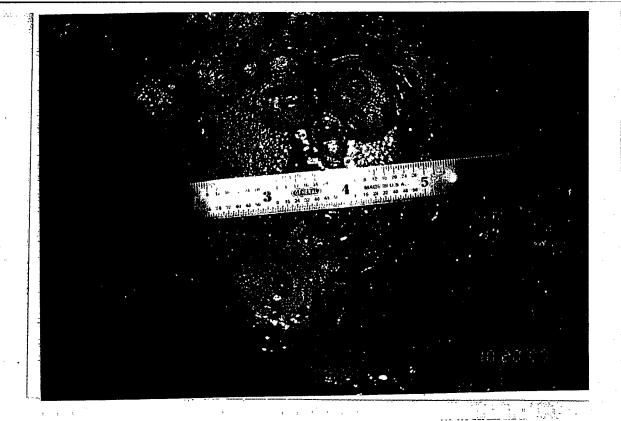
Gate 2
Bottom seal closure plate looking upstream. Standing water between closure plate, purlin webs and skinplate. Typical.

2-27



Little Goose Dam Gate 2 Skin plate pitting, typical.

10/20/00



Gate 2 Skin plate pitting, typical.

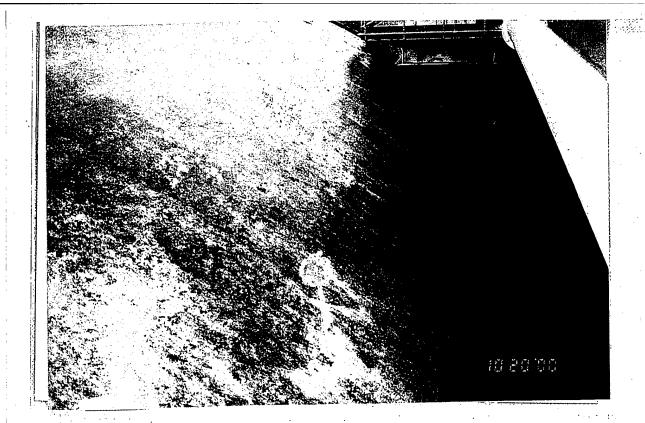




Little Goose Dam

Gate 2
Skin plate pitting, typical.

10/20/00



Gate 2 Skin plate condition, typical.

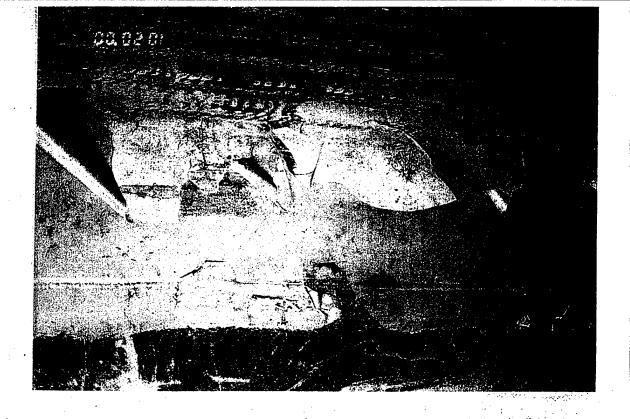
10/20/00 2-31



Little Goose Dam

Gate 2
Top of hoist connection.

10/20/00



2-33

Gate 2
Delaminates vinyl, right side of wear plate, just below skin plate transition from 3/8" to 1/2".



Little Goose Dam Gate 2
Skin plate pitting adjacent to wear plate, typical.

10/20/00



Gate 3 Left side of gate. Light corrosion on members.

10/12/00

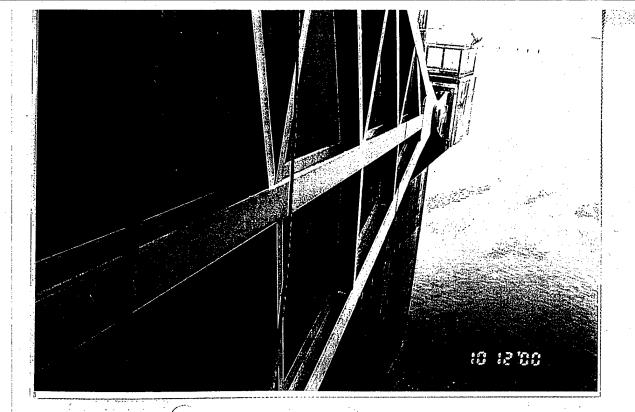
3-1



Little Goose Dam

Gate 3 Left frame, middle radial strut, typical.

10/12/00



10/12/00

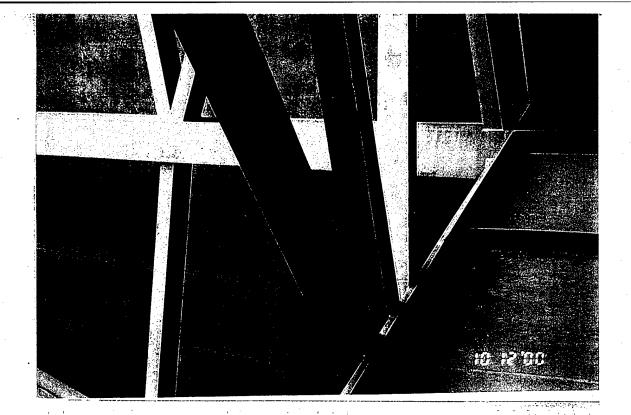
3-3

Gate 3 Left frame, typical.



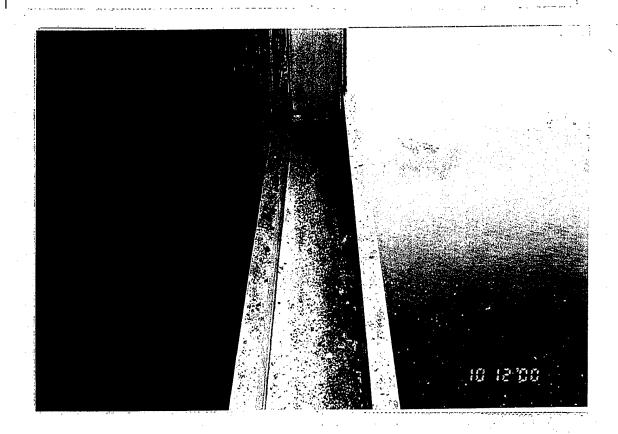
Little Goose Dam Gate 3
Left frame, Brace A. Light corrosion on upstream side.

10/12/00



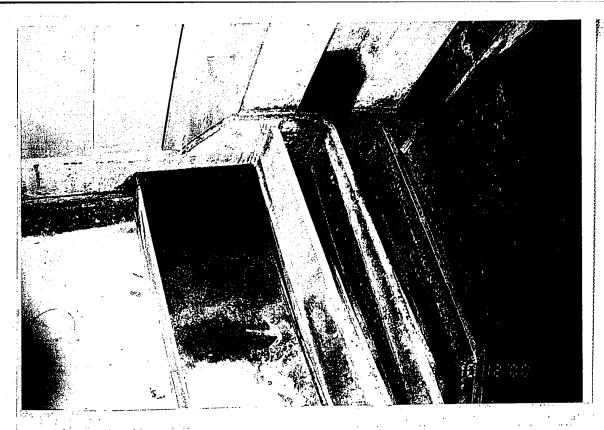
Gate 3
Middle horizontal girder bracing.
Light corrosion on braces.





Little Goose Dam Gate 3
Middle radial strut, left frame. Light corrosion on strut.

-10/12/00



Dam 10/12/00

3-7

Gate 3
Bottom horiz. girder, left end.
Standing water, no drainage between multiple stiffeners, typical.



Little Goose Dam 10/12/00 Gate 3
Standing water between closure plate, purlin webs and skinplate, typical.
Light corrosion around drain hole at upstream side of bottom radial strut.



Gate 3
Side seal leak, bottom left corner of gate. Standing water between closure plate, purlin webs and skinplate, typical.

3-9



Little Goose Dam Gate 3
Standing water between closure plate, purlin webs and skinplate, typical.

10/12/00



Gate 3
Leak at center construction joint in spillway monolith.

10/12/00



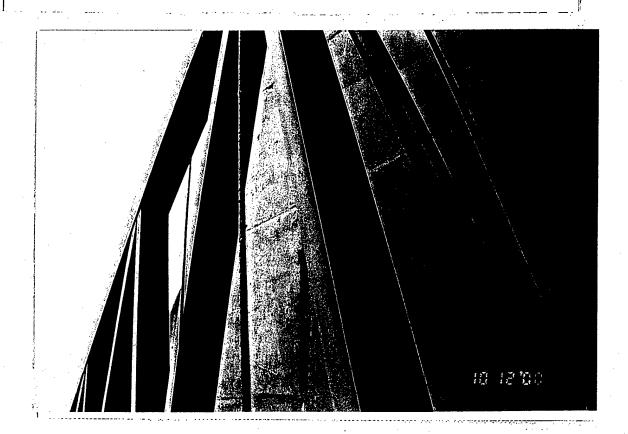
Little Goose Dam 10/12/00 Gate 3
Bottom horizontal girder, right end.
Standing water, no drainage between multiple stiffeners, typical.



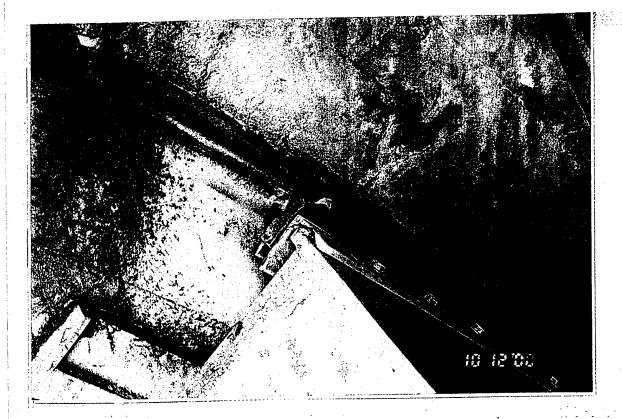
10/12/00

3-13

Gate 3 Close-up, bottom horizontal girder. Standing water, no drainage between multiple stiffeners, typical.



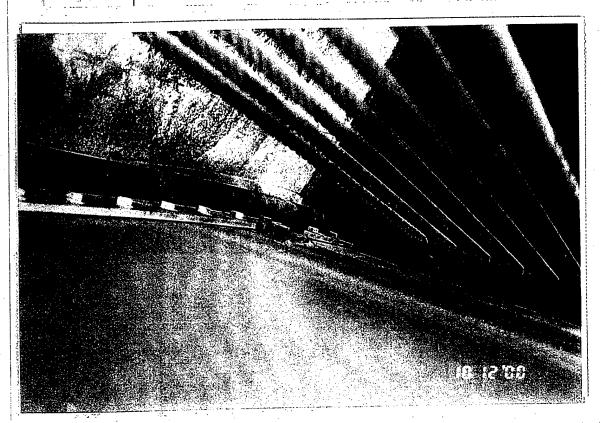
Little Goose Dam 10/12/00 Gate 3
Bottom side of right frame, typical.



Dam 10/12/00

3-15

Gate 3
Top of side seal, typical.



Little Goose Dam

10/12/00 uni

Gate 3
Top upstream skinplate at hoist cables. Moderate corrosion on unidentified metal.

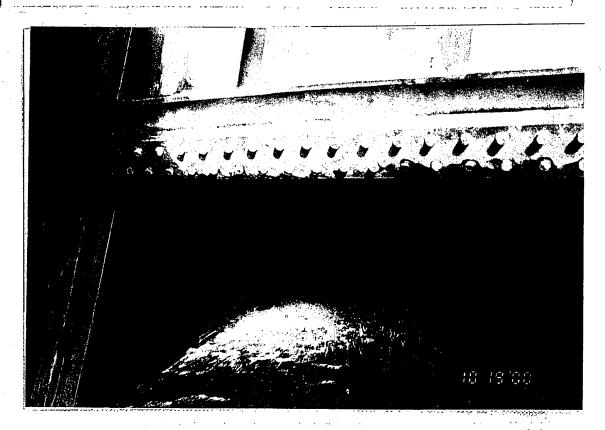


10/19/00

3-17

Gate 3

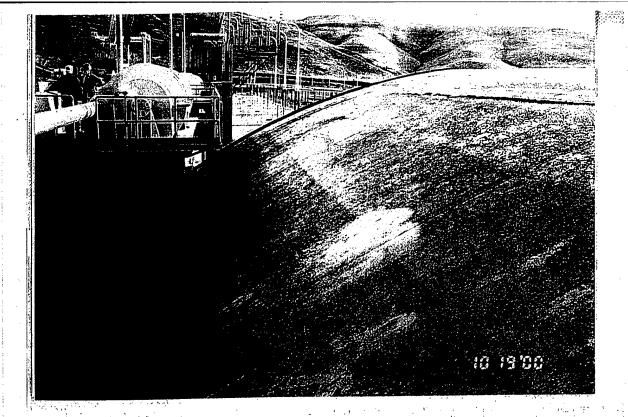
Bottom of left side of gate at 3' open. Note: Heavy falling water due to stop log leakage precludes inspection of hoist connections.



Little Goose Dam

10/19/00

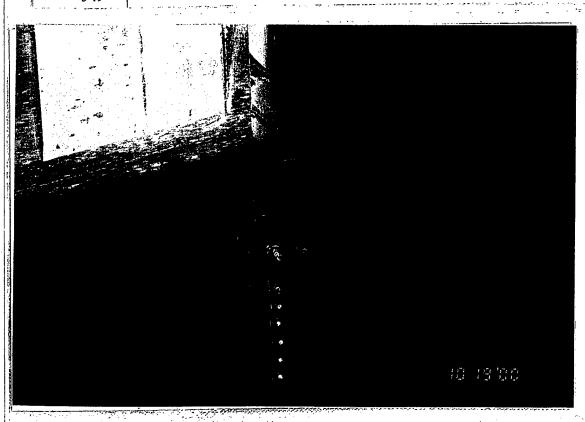
Gate 3 Bottom of right side of gate at 3' open. Note: Heavy falling water due to stop log leakage precludes inspection of hoist connections.



Gate 3
Skin plate condition, typical.
Minimal pitting.

10/19/00

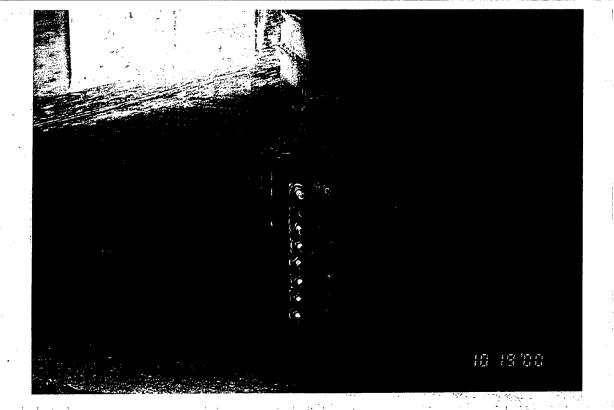
3-19



Little Goose Dam

Gate 3
Hoist connection, right side of gate.

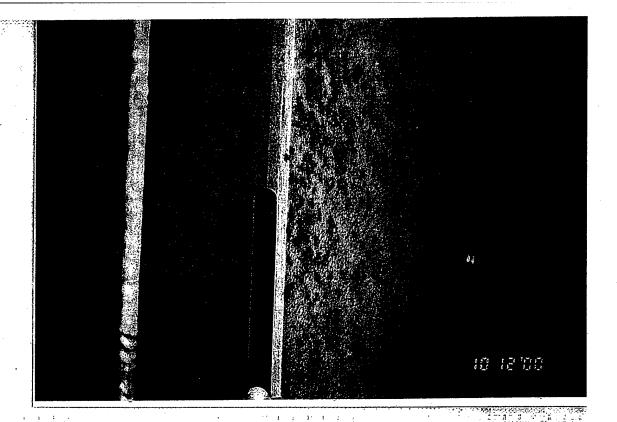
10/19/00



10/19/00

3-21

Gate 3
Hoist connection, left side of gate.



Gate 4 Skin plate purlin, right side of gate above top horizontal girder. Light corrosion on purlin flange.

4-1



Little Goose Dam

Gate 4
Top horizontal girder. Light corrosion, typical.

10/12/00



10/12/00

Gate 4
Downstream side of skin plate, right side of gate above top horizontal girder. Possible previous skin plate repair.

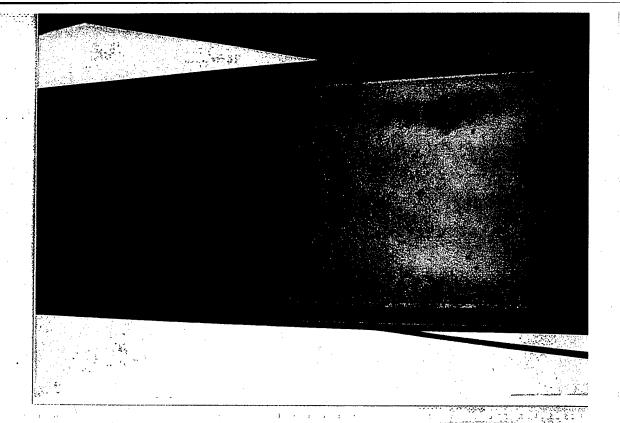
4-3



Little Goose Dam

10/12/00

Bottom horizontal girder, left side. Standing water, no drainage between multiple stiffeners, typical. Side seal leak.

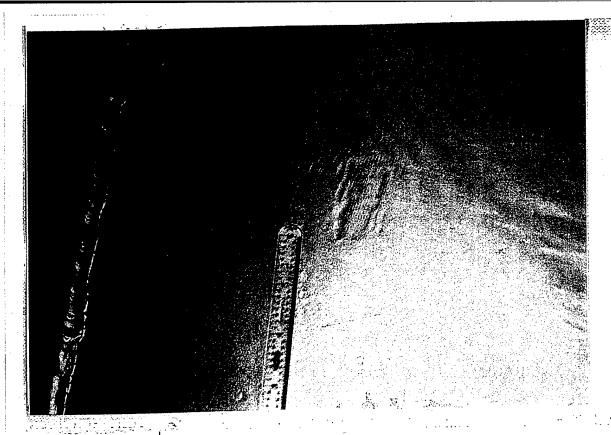


Gate 4
Right frame, brace K. Light corrosion on brace.

4-5



Little Goose Dam Gate 4
Downstream side of skin plate, above middle horizontal girder, right side of gate. Small circular protrusion in vertical line on skin plate.



10/12/00

Gate 4
Downstream side of skin plate, right side of gate above bottom horizontal girder. Possible previous skin plate repair.

4-7



Little Goose Dam

Gate 4
Brace J, left frame. Small scratches
on web.

10/12/00



Gate 4
Bottom horizontal girder, right side.
Standing water, no drainage between multiple stiffeners, typical. Side seal leak.

4-9



Little Goose Dam 10/12/00 Gate 4
Bottom seal closure plate looking upstream. Standing water between closure plate, purlin webs and skinplate. Typical.



Gate 4
Standing water between closure plate, purlin webs and skinplate, typical.
Bottom right corner seal leak. 10/12/00

4-11



Little Goose Dam

Gate 4
Leak at center construction joint in spillway monolith.

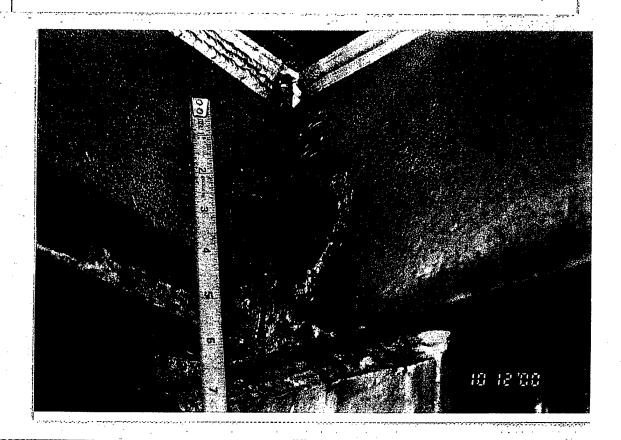
10/12/00



10/12/00

4-13

Gate 4 Leak at center construction joint in spillway monolith.



Little Goose Dam 10/12/00 Gate 4
Bottom of bottom horizontal girder, upstream flange and stiffener.
Moderate corrosion due to horizontal girder drain hole above.



10/12/00

4-15

Gate 4
Bottom of bottom horizontal girder.
Drain hole for upstream side of bottom horizontal girder. Light to moderate corrosion on surrounding members.



Little Goose Dam

4-16

10/12/00

Gate 4
Bottom of bottom horizontal girder.
Drain hole for upstream side of
bottom horizontal girder. Light to
moderate corrosion on surrounding
members.



Gate 4
Bottom of bottom horizontal girder, light corrosion on girder, stiffeners and purlins.

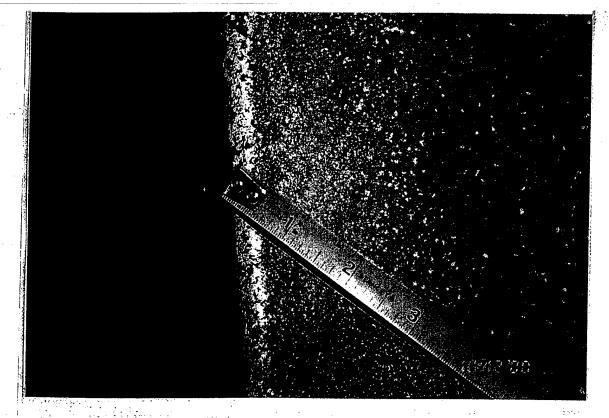
4-17



Little Goose Dam

10/12/00

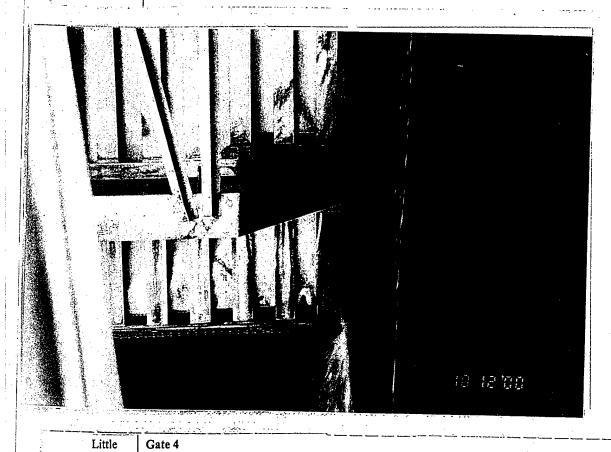
Gate 4
Bottom horizontal girder, left side.
Standing water, no drainage between multiple stiffeners, typical. Side seal leak.



Gate 4
Brace N, left frame. Light corrosion on brace web and flanges.

10/12/00

4-19



Little Goose Dam

Bottom horizontal girder, left side. Standing water, no drainage between multiple stiffeners, typical. Side seal

4-20

10/12/00 leak.



10/12/00

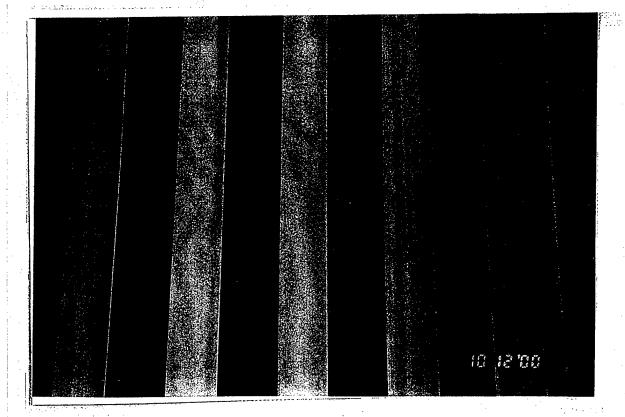
4-21

Gate 4
Side seal leak, left side of gate.



Little Goose Dam Gate 4
Side seal plates, nuts and bolts, typical.

10/12/00



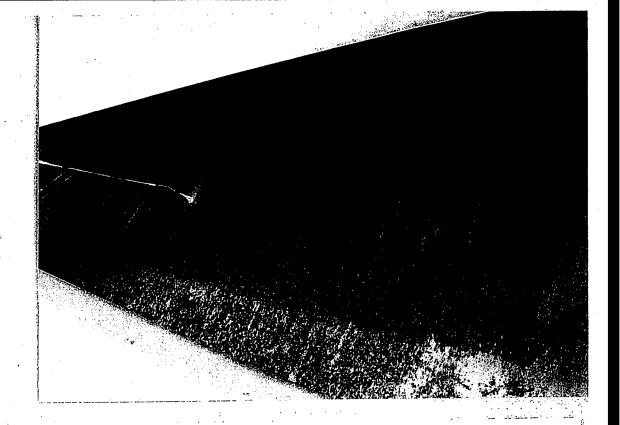
Gate 4
Downstream side of skin plate.
Evidence of previous repairs.

10/12/00

4-23



Little Goose Dam 10/19/00 Gate 4
Top horizontal girder, left side. 2" to 3" deformation upward in girder web.



Gate 4
Waterblasting and skin plate
condition, minimal pitting, typical.

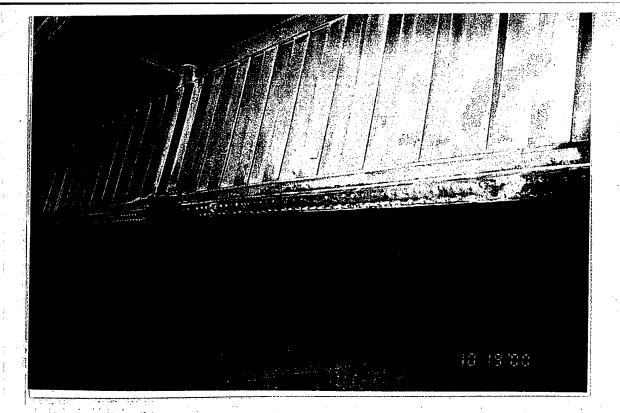
10/19/00

4-25



Little Goose Dam Gate 4
Bottom left corner of gate, typical.

10/19/00

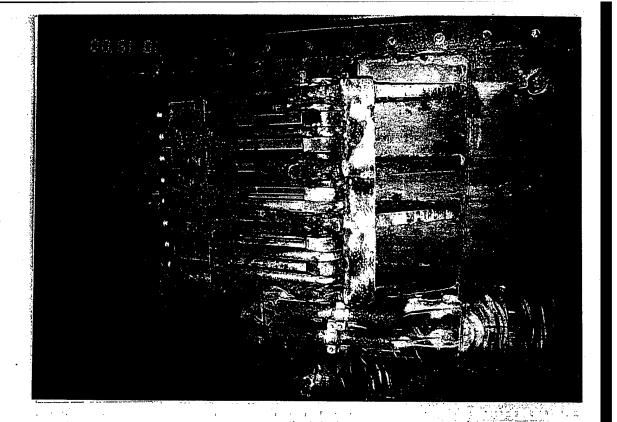


Gate 4
Bottom seal keeper plate, typical.

10/19/00

Little Goose Dam Gate 4
Right hoist connection. Moderate corrosion on lifting lugs, and plates.

10/19/00



Gate 4
Right hoist connection. Moderate corrosion on lifting lugs, and plates.

10/19/00

4-29



Little Goose Dam Gate 4
Bottom seal and bottom upstream side of skin plate. Moderate corrosion at bottom edge of skin plate.

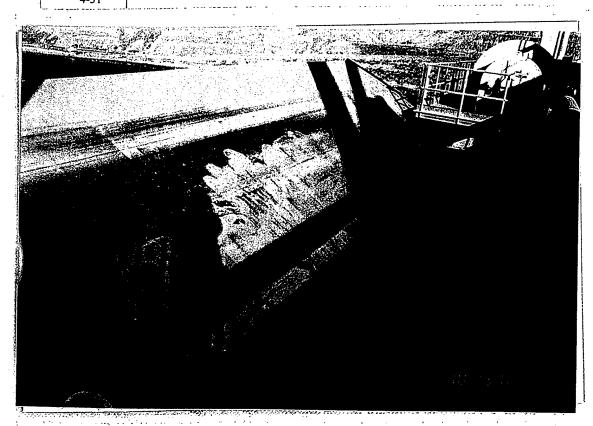
10/19/00



Gate 4
Bottom seal, typical.

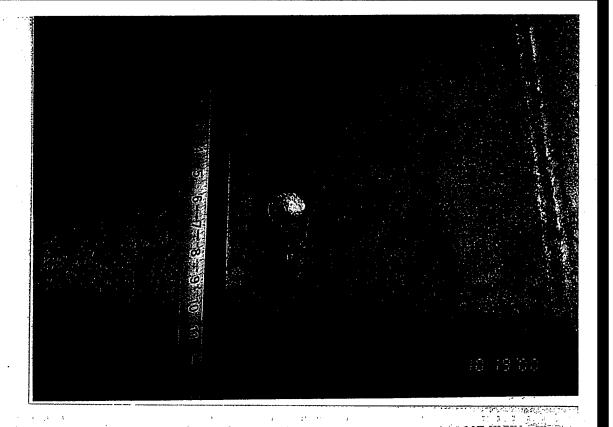
10/19/00

4-31



Little Goose Dam Gate 4
Skin plate condition, minimal pitting, typical.

10/19/00



Gate 4
Skin plate pitting, where present, typical.

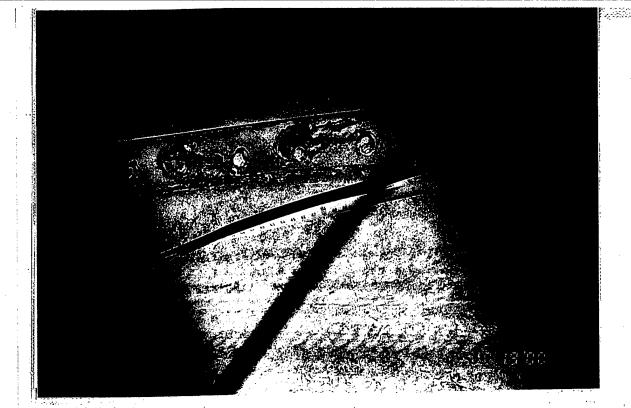
10/19/00

4-33



Little Goose Dam Gate 4
Side seal angles, wear plate and side seal, typical.

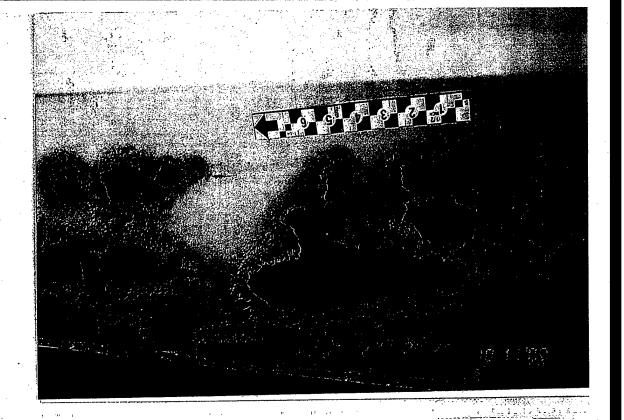
10/19/00



10/19/00

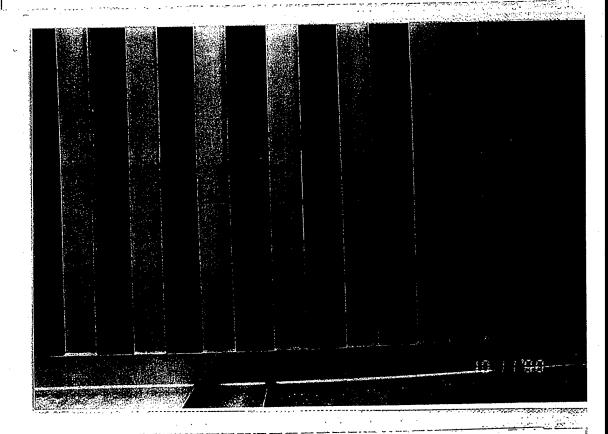
4-35

Gate 4
Side seal angles, side seal, and side seal, typical



5-1

Gate 5
Downstream side of skin plate, left side of gate, above top horiz. girder. Peeling pain, light corrosion.
Appears to be possible paint blister due to upstream skin plate welding.



Little Goose Dam

10/11/00

Gate 5
Downstream side of skin plate, left side of gate, above top horiz. girder. Peeling pain, light corrosion.
Appears to be possible paint blister due to upstream skin plate welding.



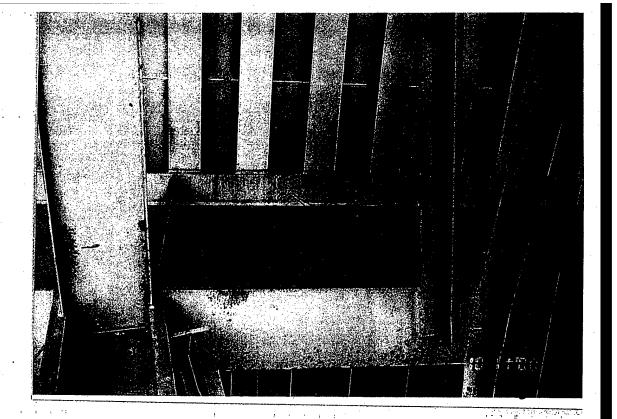
5-3

Gate 5
Top horizontal girder, left side of gate. Light corrosion on girder web, purlins, braces.



Little Goose Dam Gate 5
Left frame, Brace D. light corrosion and brace.

10/11/00



Gate 5
Middle horizontal girder, left end.
Light corrosion on girder, braces and skin plate. 10/11/00



Little Goose Dam 10/11/00

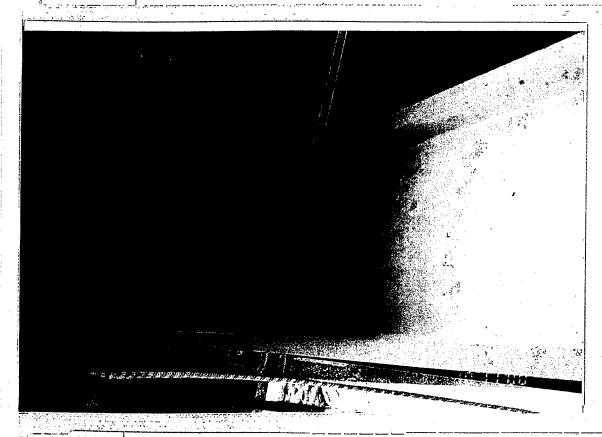
5-6

Gate 5 Downstream side of skin plate, left side of gate, above middle horiz. girder. Peeling pain, light corrosion. Appears to be possible paint blister due to upstream skin plate welding.



Gate 5
Bottom horizontal girder, left end.
Standing water, no drainage between multiple stiffeners, typical.

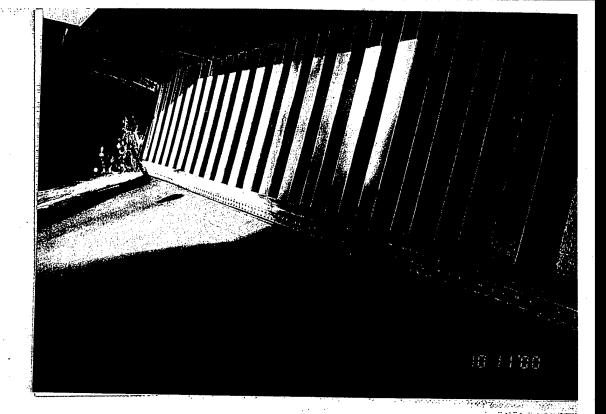
5-7



Little Goose Dam

Gate 5 Let frame, Brace J. Light corrosion on bottom radial strut and brace.

10/11/00



10/11/00

5-9

Gate 5 Leak at center construction joint in spillway monolith.



Little Goose Dam

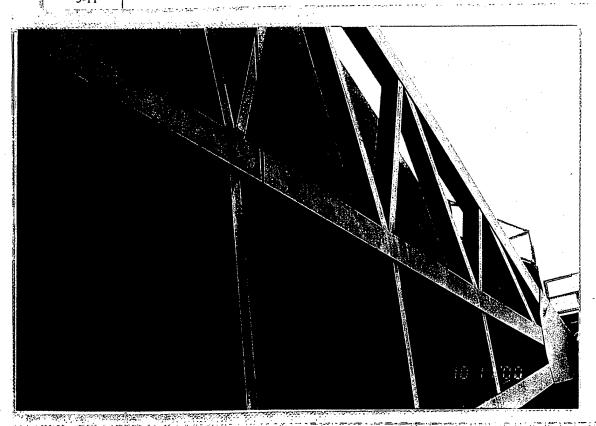
10/11/00

Gate 5
Bottom left corner of gate, bottom seal leak. Bottom seal closure plate. Standing water between closure plate, purlin webs and skinplate, typical.



Gate 5
Bottom seal closure plate. Standing water between closure plate, purlin webs and skinplate, typical.

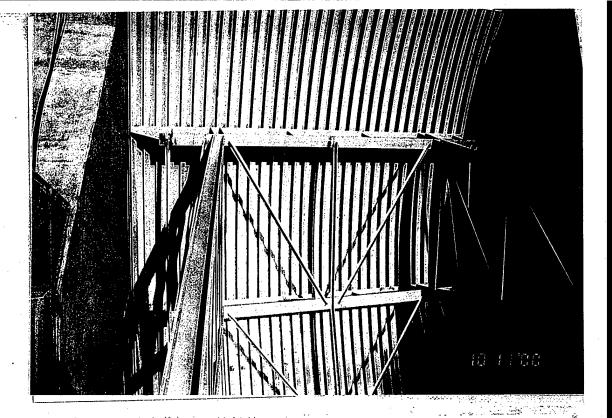
5-11



Little Goose Dam

Gate 5 Left frame, typical.

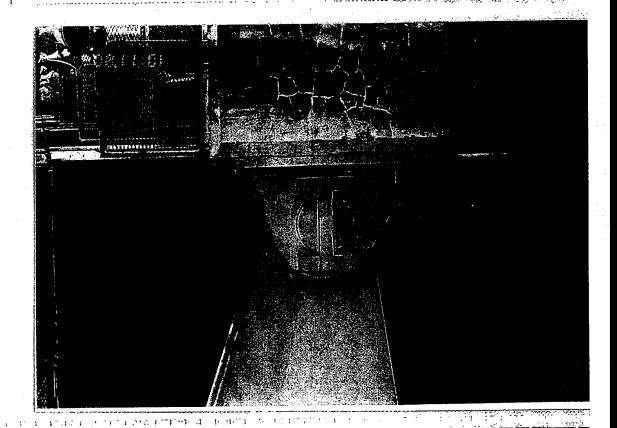
10/11/00



m |

5-13

Gate 5
Gate face, typical.



Little Goose Dam

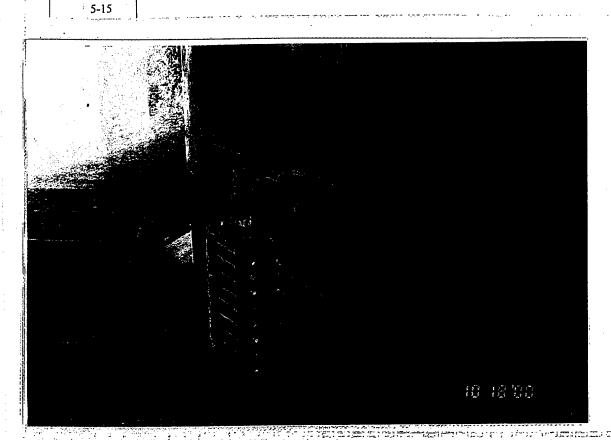
Left trunnion block. Light cracking in concrete.

10/11/00



10/11/00

Gate 5
Top of right trunnion. Standing water due to inadequate drainage in top radial strut web.



Little Goose Dam

Gate 5
Top of right hoist connection. Light corrosion on lifting lugs and plates.

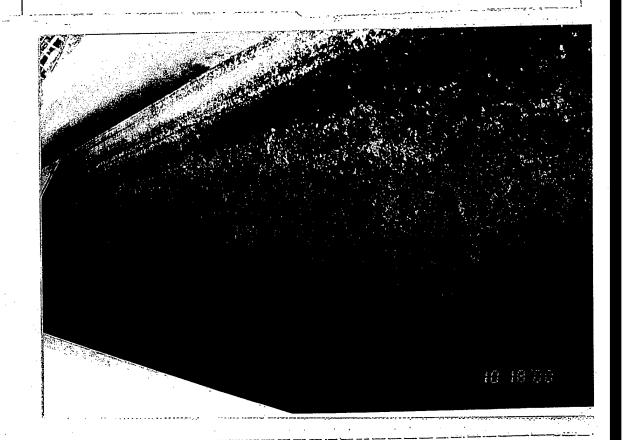
10/18/00



Gate 5

10/11/00

5-17



Little Goose Dam

10/11/00

Gate 5



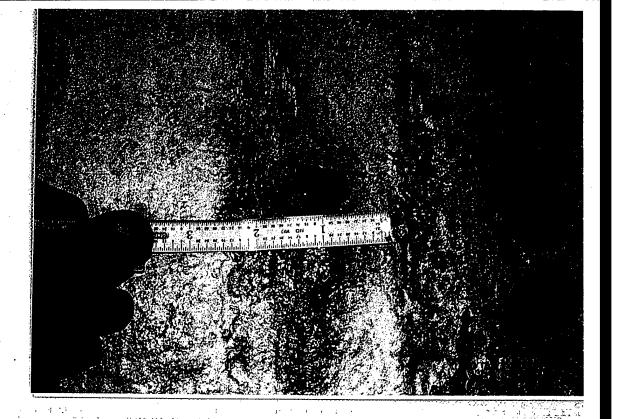
Gate 5

5-19

Little Goose Dam

Gate 5

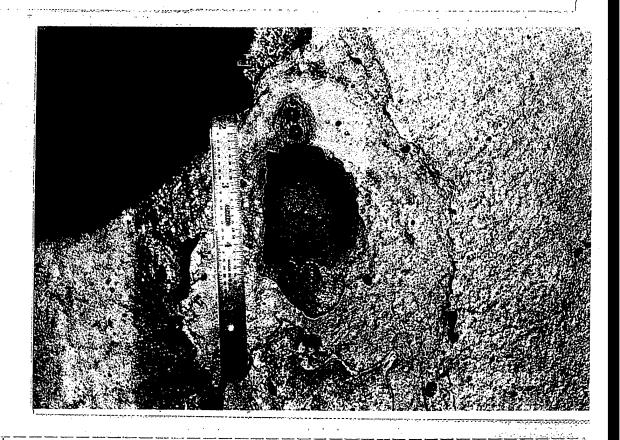
10/11/00



Gate 5
Bottom seal keeper plate, typical.

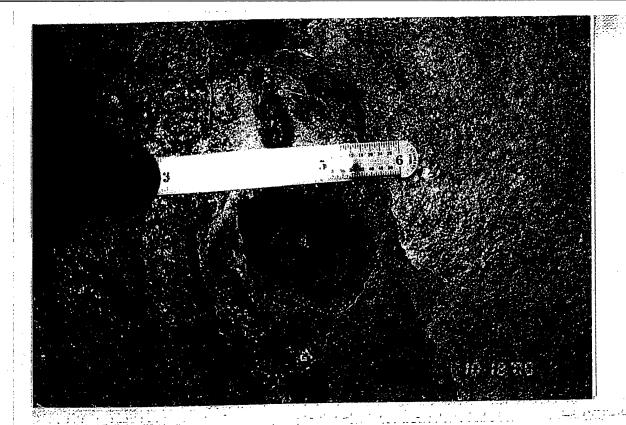
10/18/00

5-21



Little Goose Dam Gate 5
Waterblasting and typical skin plate condition. Minimal pitting on skin plate (except for wear plates).

10/18/00 5-22



Little Goose Dam 10/18/00 5-23

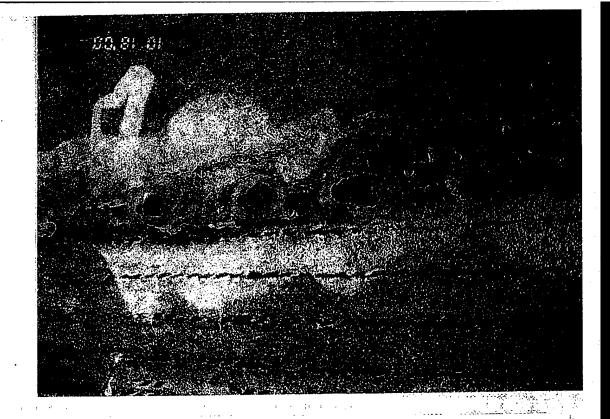
Gate 5
Heavy pitting on wear plate, typical.



Little Goose Dam

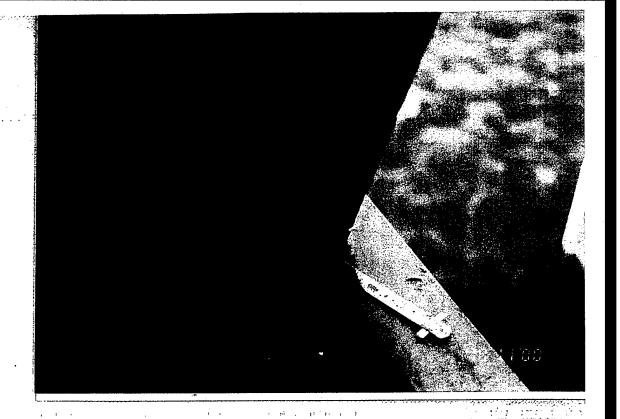
Gate 5
Heavy pitting on wear plate, typical.

10/18/00 5-24



Gate 5 Heavy pitting on wear plate, typical.

10/18/00



Gate 6 Left frame, Brace B. Light corrosion on brace (see photo 6-2).

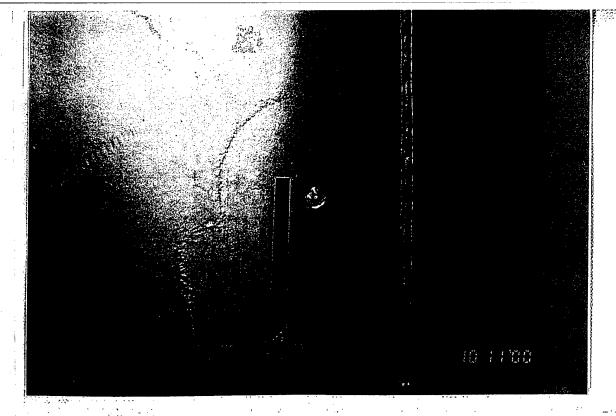
10/11/00

6-1



Little Goose Dam Gate 6
Left frame, Brace B. Light corrosion on brace.

10/11/00



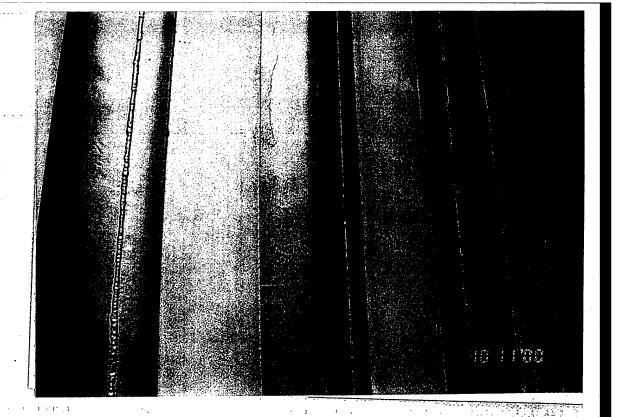
Gate 6
Downstream side of skin plate, left side of gate, above middle horizontal girder. Apparent skin plate repair.

6-3



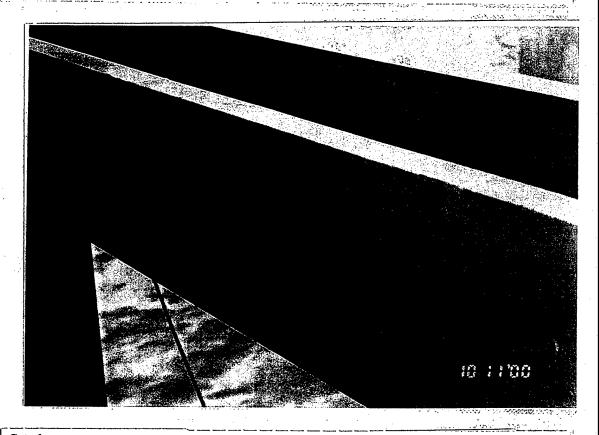
Little Goose Dam Gate 6 Left frame, brace D. Light corrosion.

10/11/00



Gate 6
Downstream side of skin plate, left side of gate, above middle horizontal girder. Discolorization due to apparent repainting and possible skin plate repair.

6-5



Little Goose Dam Gate 6
Left frame, middle radial strut. Light pitting on outside flange.

10/11/00

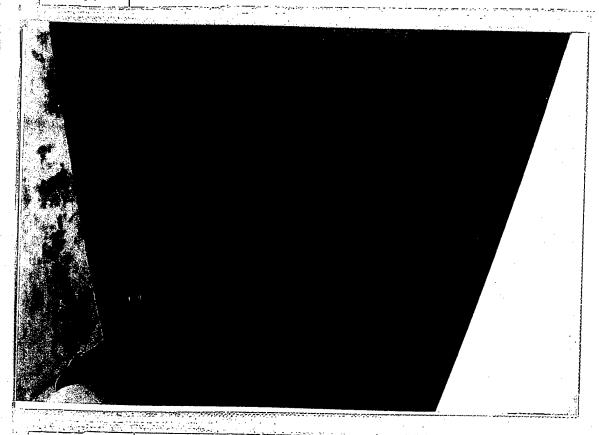


Gate 6

Downstream side of skin plate, apparent skin plate repair grinding.

10/11/00

6-7

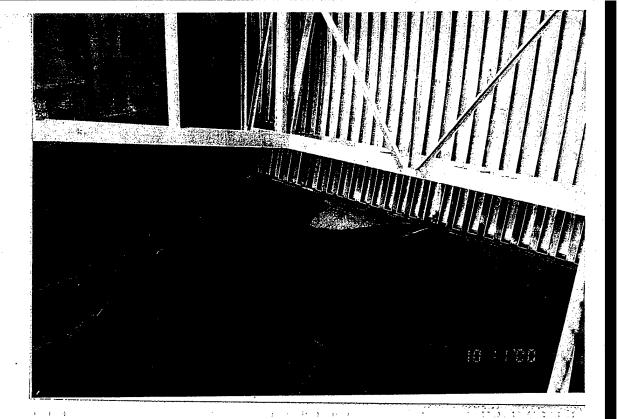


Little Goose

Dam

Gate 6
Light corrosion and debris coating on braces, typical.

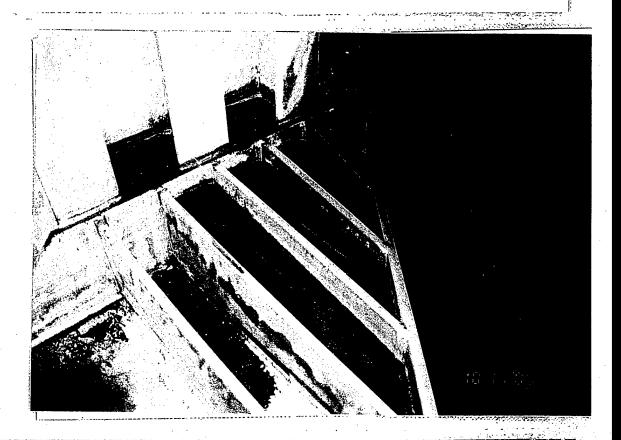
10/11/00



10/11/00

Gate 6
Gate face and spillway, typical. Leak at center construction joint in spillway monolith.

6-9

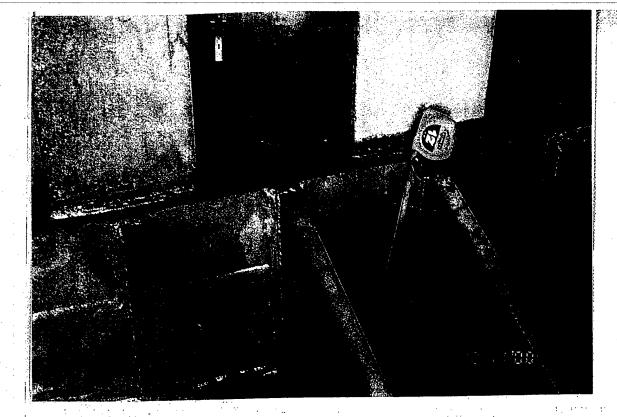


Little Goose Dam

10/11/00

Gate 6 Bottom horizontal girder. Standing water, no drainage between multiple stiffeners, typical. Horizontal girder to skin plate stiffeners, standing

water, debris and no drainage.



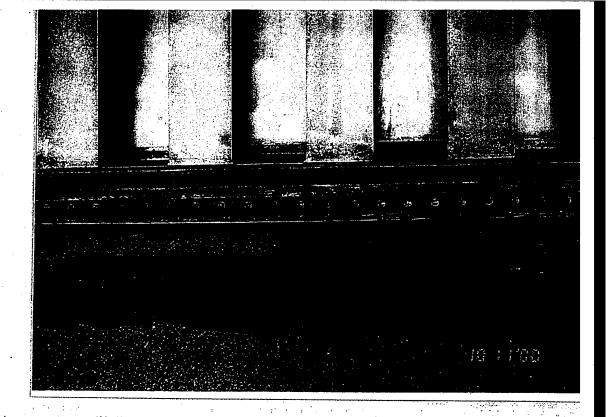
Gate 6
Bottom horizontal girder. Standing water, no drainage between multiple stiffeners, typical. Horizontal girder to skin plate stiffeners, standing water, debris and no drainage.



Little Goose Dam Gate 6
Bottom horizontal girder. Evidence of standing water on girder web and flange.

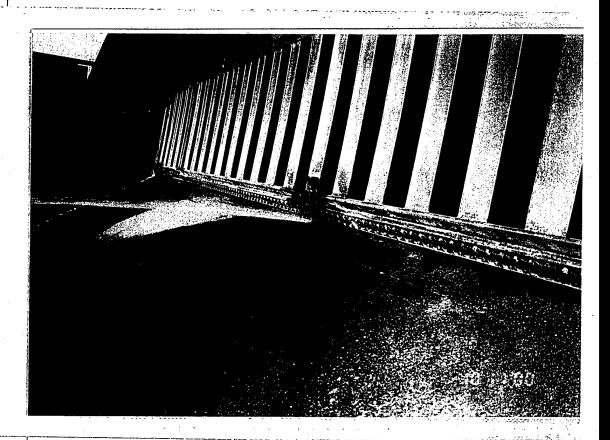
6-12

10/11/00



Gate 6
Bottom seal keeper plate, typical.
Bottom seal closure plate, standing water between closure plate, purlin webs and skinplate, typical.

6-13



Little Goose Dam Gate 6
Leak at center construction joint in spillway monolith.

10/11/00



10/11/00

6-15

Gate 6

Bottom seal closure plate, standing water between closure plate, purlin webs and skinplate, typical.



Little Goose Dam Gate 6
Bottom of bottom horizontal girder at radial strut connection and girder drain hole. Light corrosion on girder web and stiffeners.

6-16

10/11/00



Gate 6
Bottom of bottom horizontal girder at radial strut connection and girder drain hole. Light corrosion on girder web and stiffeners.

6-17



Little Goose Dam Gate 6
Leak at center construction joint in spillway monolith. Light corrosion on bottom seal keeper plate.

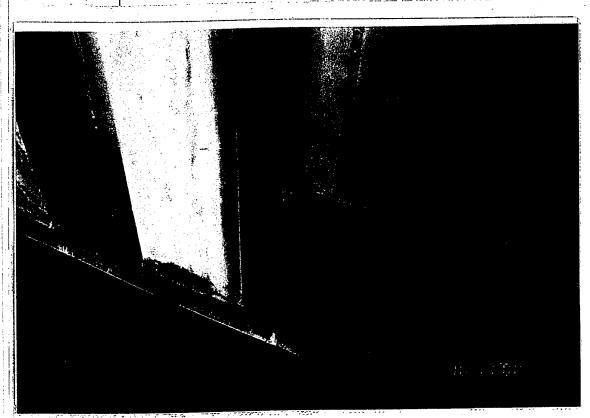
10/11/00



10/11/00

6-19

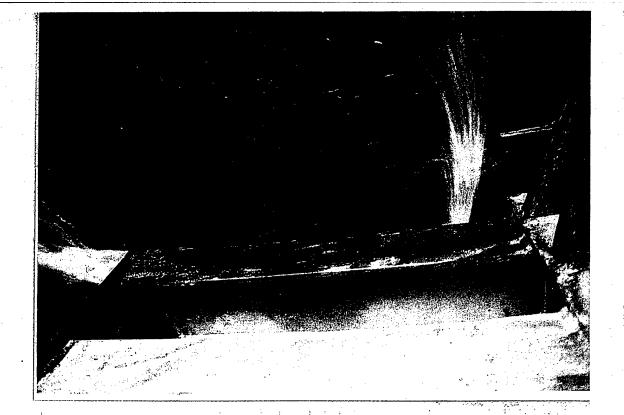
Gate 6
Bottom of bottom horizontal girder at radial strut connection and girder drain hole. Light corrosion on girder web and stiffeners.



Little Goose Dam

10/11/00

Gate 6
Bottom seal closure plate, standing water between closure plate, purlin webs and skinplate, typical.



10/11/00

6-21

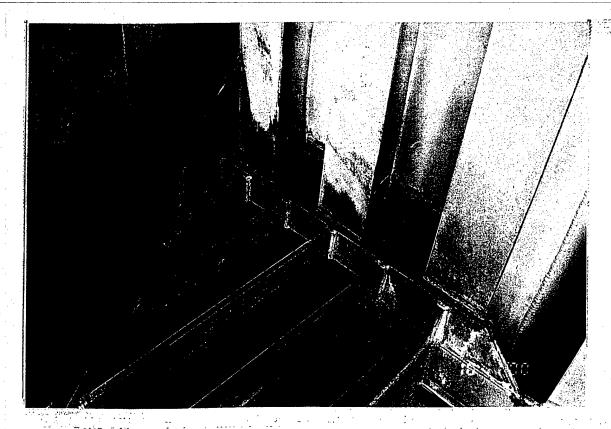
Gate 6
Side seal leak, bottom left side of gate. Light corrosion on purlin, horizontal girder and girder stiffeners.



Little Goose Dam

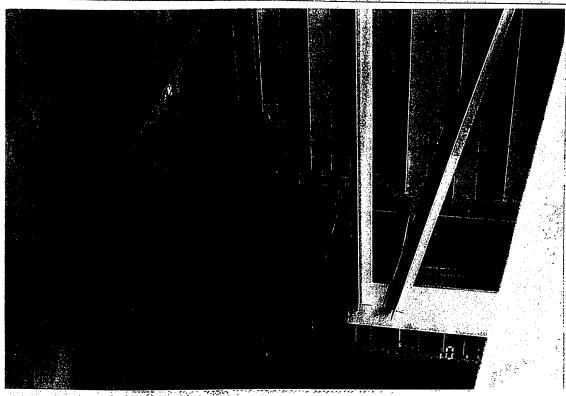
Side seal leak, bottom right side of gate. Light corrosion on purlin, horizontal girder and girder stiffeners. 10/11/00

Gate 6



Gate 6
Bottom horizontal girder. Standing water, no drainage between multiple stiffeners, typical. Horizontal girder to skin plate stiffeners, standing water, debris and no drainage.

6-23



Little Goose Dam 10/11/00 Gate 6
Bottom horizontal girder. Standing water, no drainage between multiple stiffeners, typical. Horizontal girder to skin plate stiffeners, standing water, debris and no drainage.



10/18/00

6-25

Gate 6 Bottom seal keeper plate, typical.



Little Goose Dam

Gate 6
Bottom seal keeper plate, typical.

10/18/00



10/18/00

. 0718/00

Gate 6

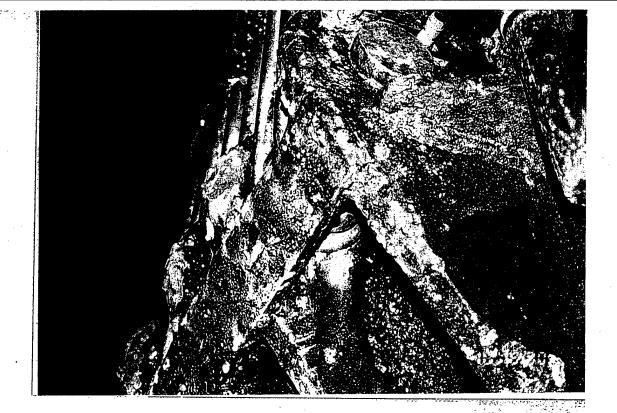
Left hoist connection and anodes.
Light to moderate corrosion on
lifting lugs and plates. Note: Extra
anode under hoist connection not
found on other gates.



Little Goose Dam

Gate 6
Hoist connection anodes, typical.

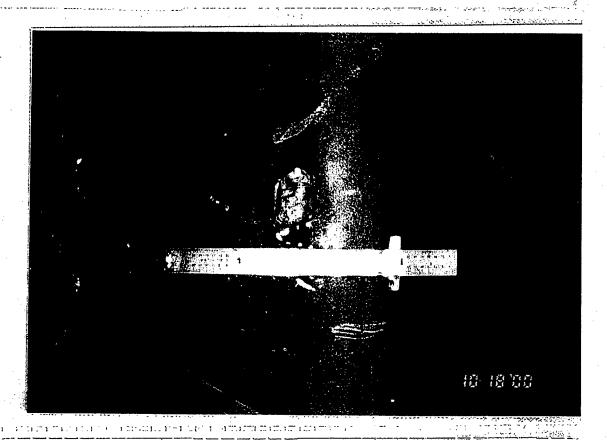
10/18/00



10/18/00

6-29

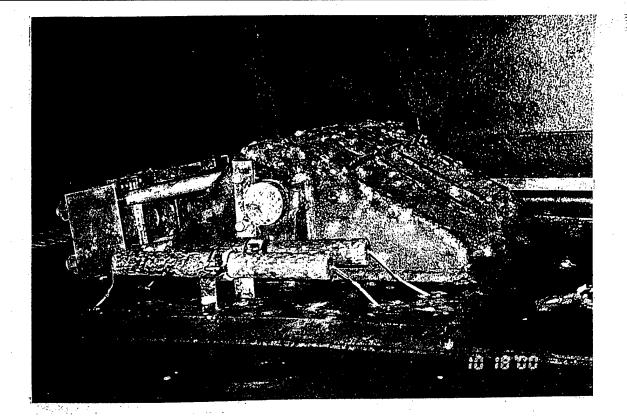
Gate 6
Close-up hoist connection. Light to moderate corrosion on lifting lugs and plates.



Little Goose Dam Gate 6

Close-up, embedded bottom seal in spillway.

10/18/00



Gate 6
Right hoist connection. Light to moderate corrosion on lifting lugs and plates.

10/18/00



Little Goose Dam Gate 6
Right hoist connection. Light to moderate corrosion on lifting lugs and plates. Note: Generally good condition of anodes.

10/18/00 6-32



Gate 6
Apparent previous anode bracket.

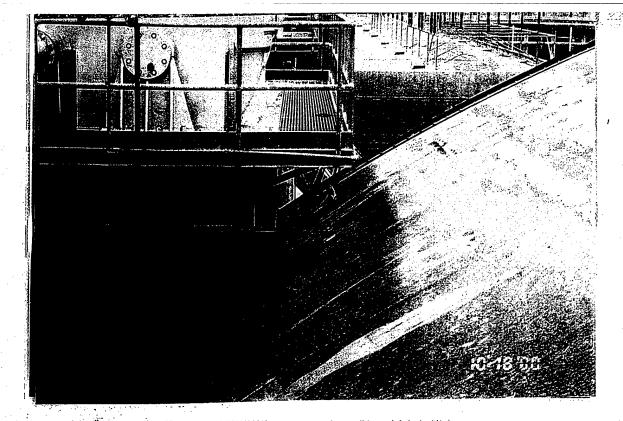
6-33



Little Goose Dam

Gate 6
.Skin plate pitting, typical.

10/18/00



Gate 6
Skin plate condition, typical.
Minimal skin plate pitting.

10/18/00

6-35



Little

Goose Dam

Gate 6
Skin plate condition, typical.
Minimal skin plate pitting.

10/18/00



Gate 6
Left wear plate. Delaminated vinyl coating.

10/18/00

6-37



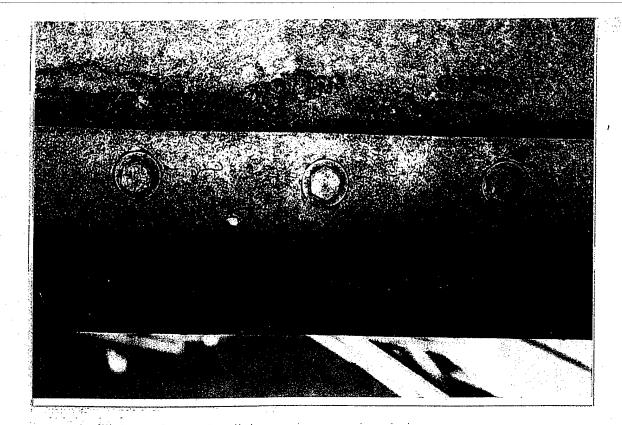
Little Goose Dam

Gate 6
Left wear plate. Delaminated vinyl coating.

10/18/00

6-38

1)



Gate 6 Upstream side of side seal, typical.

10/18/00

6-39

io is to

Little Goose Dam

Gate 6
Light pitting along skin plate weld, typical.

10/18/00



Gate 7
Right frame, brace F. Loose moderate corrosion on brace.

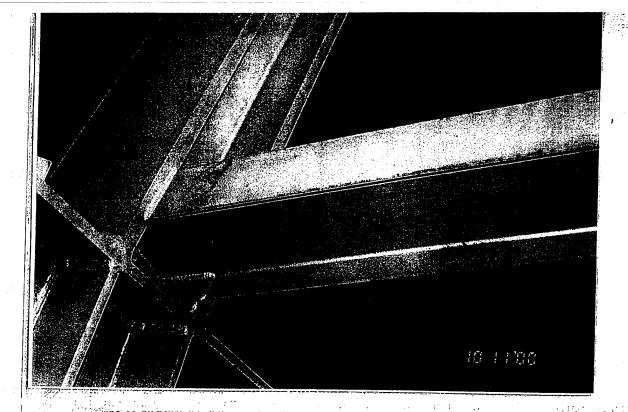
10/11/00

7-1



Little Goose Dam Gate 7
Bottom horizontal girder, right end.
Standing water, no drainage between multiple stiffeners, typical.

10/11/00



10/11/00

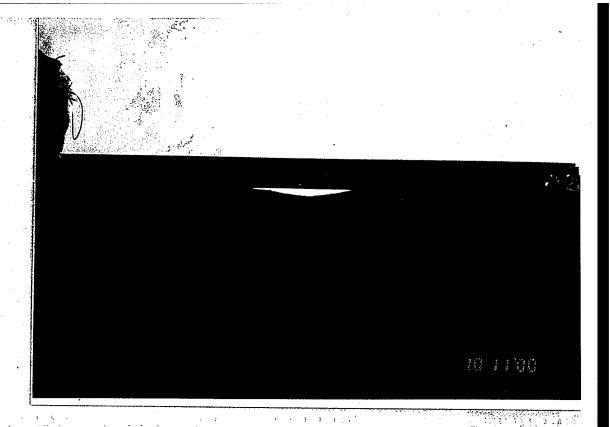
Gate 7
Left frame, Brace A. Light corrosion on brace, radial strut and horizontal girder.



Little Goose Dam

Gate 7
Middle horizontal girder, typical.

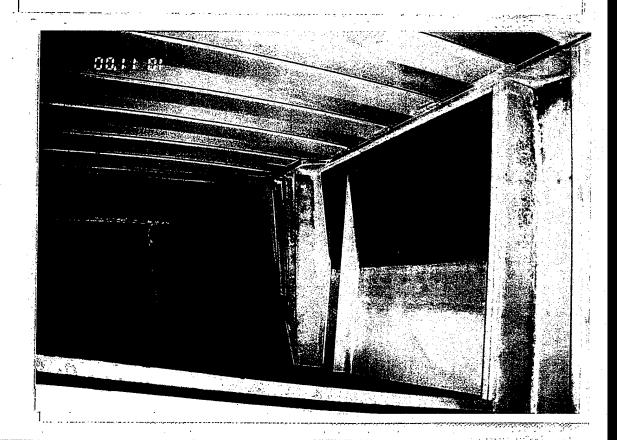
10/11/00



10/11/00

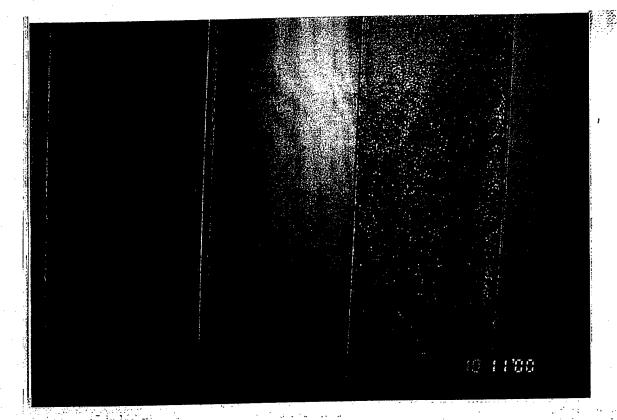
7-5

Gate 7 Right frame, Brace L. Small deformation in brace flange.



Little Goose Dam Gate 7
Bottom horizontal girder, right end.
Standing water on girder web due to inadequate drainage and side seal leak.

10/11/00



Gate 7
Skin plate purlins, typical.

10/11/00



Little Goose Dam Gate 7
Bottom right corner of gate, side seal leak.

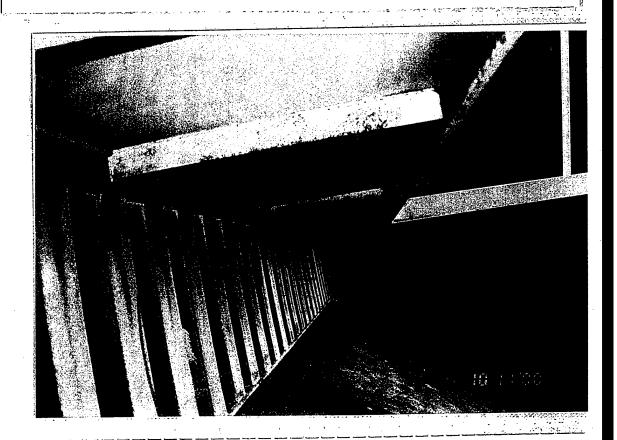
10/11/00



Little Goose Dam 10/11/00

Gate 7
Bottom seal closure plate looking upstream. Standing water between closure plate, purlin webs and skinplate. Typical.

7-9



Little Goose Dam Gate 7
Bottom of bottom horizontal girder, typical.

10/11/00



Little Goose Dam 10/11/00

Gate 7
Bottom seal closure plate looking upstream. Standing water between closure plate, purlin webs and skinplate, typical.

7-11



Little Goose Dam Gate 7
Bottom horizontal girder, left end.
Standing water, no drainage between multiple stiffeners, typical.

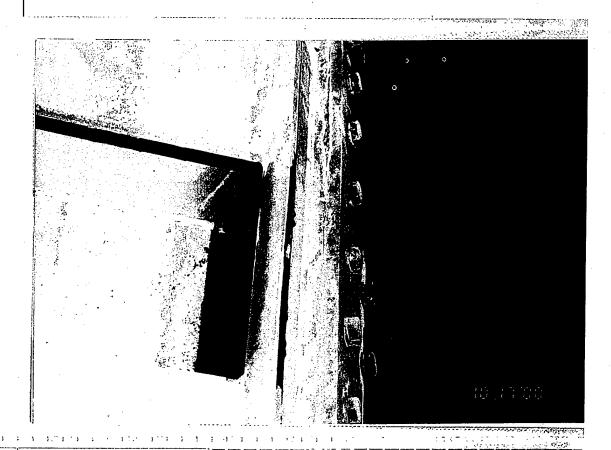
10/11/00



10/17/00

7-13

Gate 7 Bottom seal closure plate. Standing water between closure plate, purlin webs and skinplate, typical.



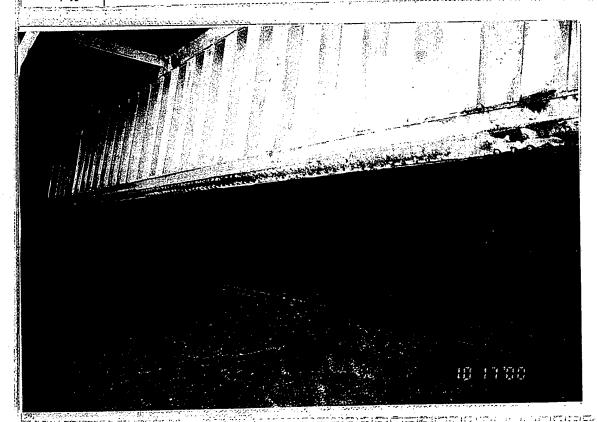
Little Goose Dam 10/17/00

Gate 7
Bottom seal closure plate. Standing water between closure plate, purlin webs and skinplate, typical.



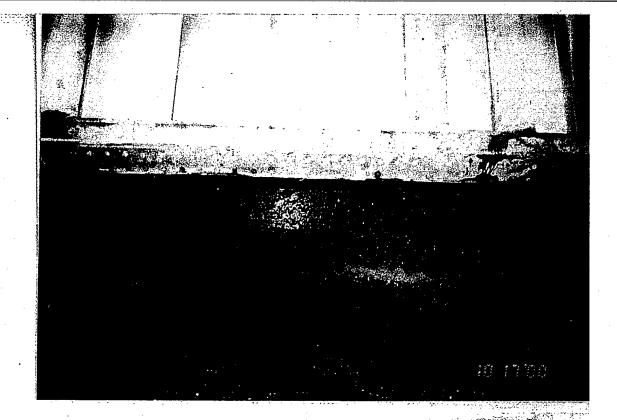
Little Goose Dam 10/17/00 Gate 7
Stop log leakage precluding inspection of hoist connections from bottom.

7-15



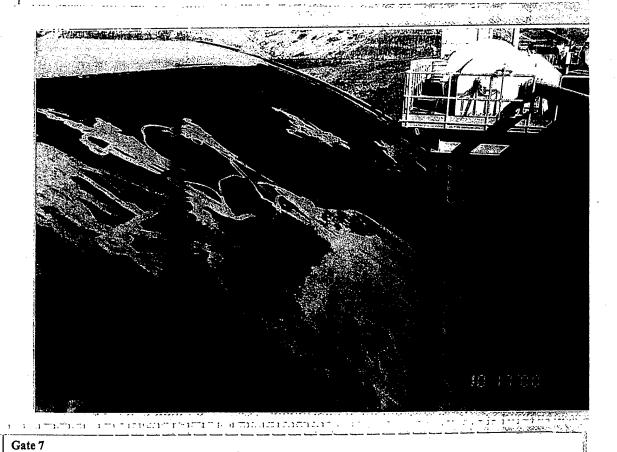
Little Goose Dam Gate 7
Bottom of gate and bottom seal keeper plate, typical. Stop log leakage precluding inspection of hoist connections from bottom.

10/17/00



Little Goose Dam 10/17/00 Gate 7
Bottom seal keeper plate, typical.
Stop log leakage precluding inspection of hoist connections from bottom.

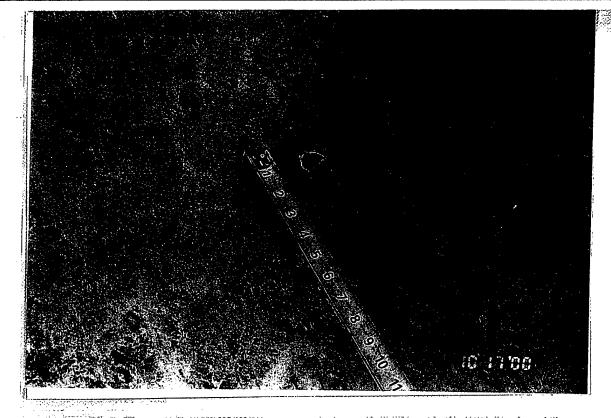
7-17



Little Goose Dam

Skin plate condition, typical.

10/17/00



Gate 7
Skin plate pitting, typical.

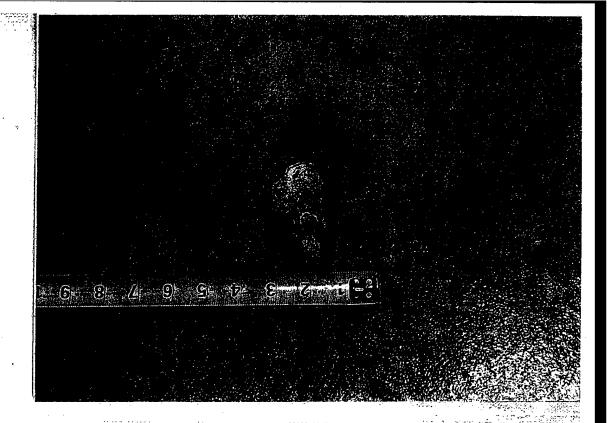
7-19



Little Goose Dam

Gate 7
Skin plate pitting, typical.

10/17/00 7-20



Gate 7 Skin plate pitting, typical.

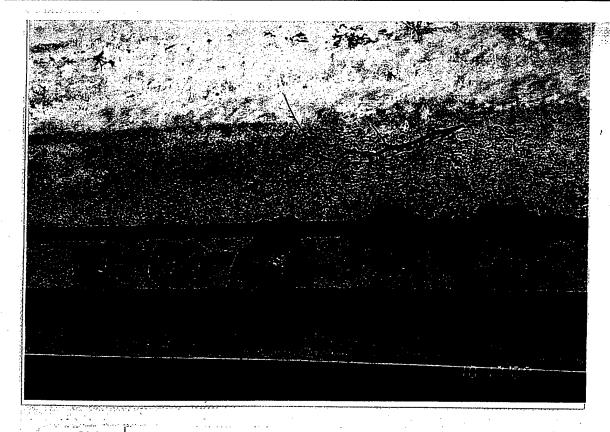
10/17/00 7-21



Little Goose Dam

Gate 7
Skin plate pitting, typical.

10/17/00



Gate 7
Upstream side of side seal, typical.

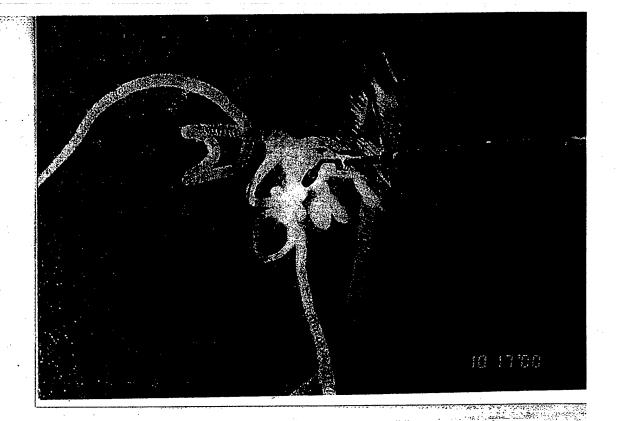
10/17/00 7-23



Little Goose Dam

Gate 7
Wear plate condition, typical.

10/17/00



Gate 7
Waterblasting skin plate.

10/17/00 7-25



Little Goose Dam

Gate 7
Hoist connection, from above.

10/17/00

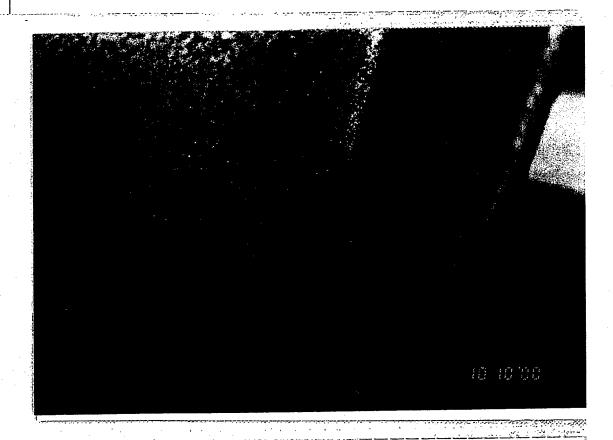


Gate 7
Hoist connection from above. Light to moderate corrosion on lifting lugs and plates. Stainless steel U-bolts and socket blocks in good condition.



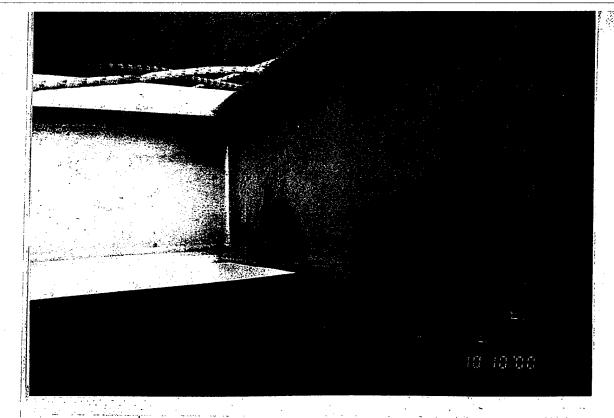
Little Goose Dam 10/10/00 Gate 8 Left frame Brace C. Light corrosion on brace, typical.

8-1



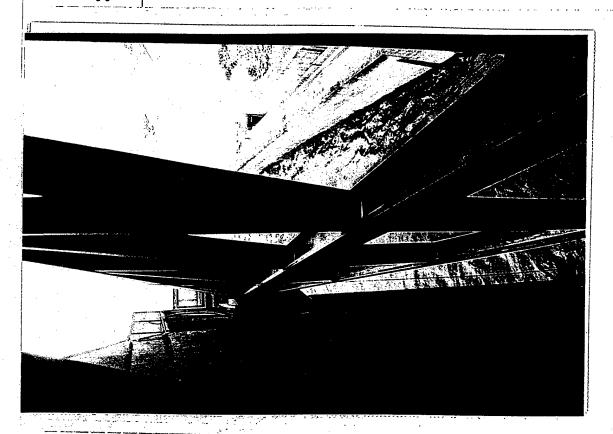
Little Goose Dam Gate 8
Close-up, left frame Brace D. Light corrosion on brace, typical.

10/10/00



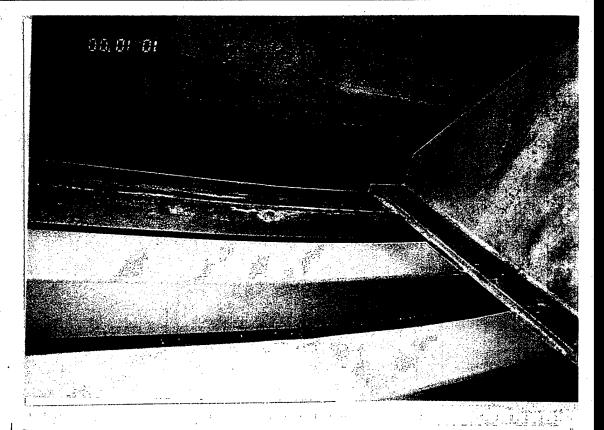
Gate 8
Left frame Brace G. Light corrosion on brace, typical.

8-3



Little Goose Dam Gate 8
Outside of left frame, typical.

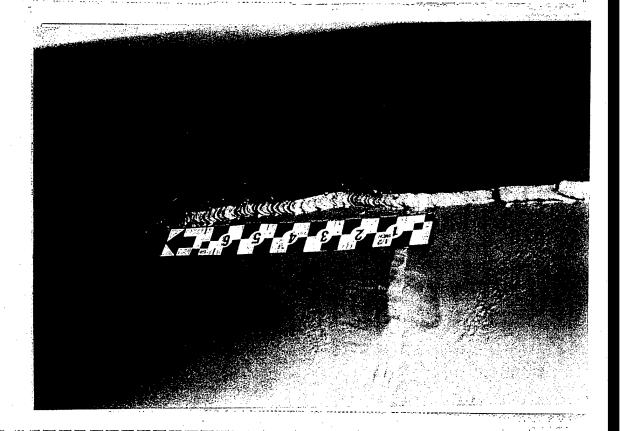
10/10/00



10/10/00

8-5

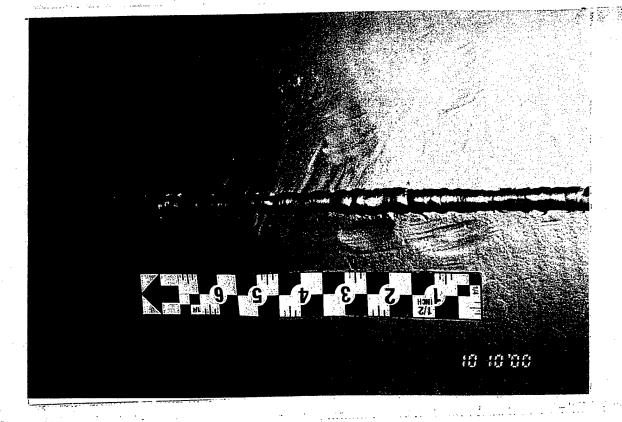
Gate 8
Left end, middle horizontal girder.
Light corrosion on girder, purlins.



Little Goose Dam

10/10/00

Gate 8
Downstream surface of skin plate, left side of gate above middle horizontal girder. Apparent grind marks from weld repair.



Little Goose Dam 10/10/00 Gate 8
Downstream surface of skin plate, left side of gate above middle horizontal girder. Apparent grind marks from weld repair.

8-7

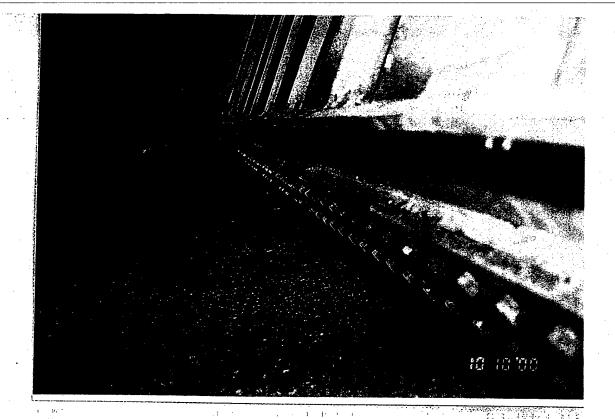


Little Goose Dam

10/10/00

Gate 8
Bottom horizontal girder. Standing water, no drainage between multiple stiffeners, typical. Girder flange to skin plate stiffeners, standing water, no drainage.

Q .Q



10/10/00

8-9

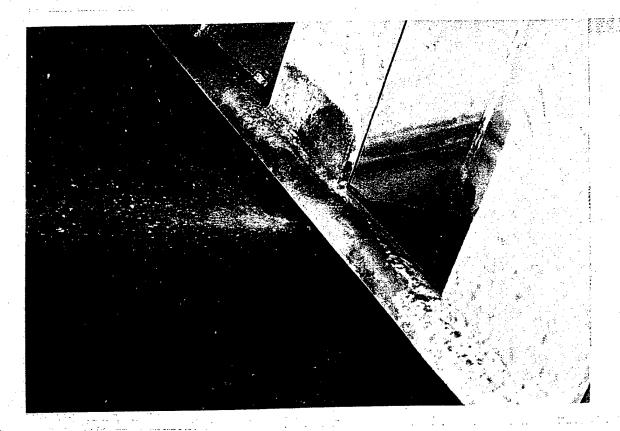
Gate 8
Bottom seal keeper plate, light corrosion, typical. Leak at center construction joint in spillway monolith.



Little Goose Dam

10/10/00

Bottom seal closure plate looking upstream. Standing water between closure plate, purlin webs and skinplate, typical.



10/10/00

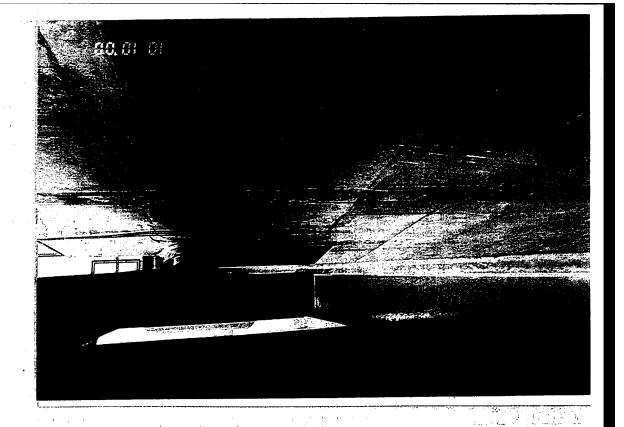
8-11

Gate 8
Bottom seal closure plate, standing water between closure plate, purlin webs and skinplate, typical. Leak at center construction joint in spillway monolith.



Little Goose Dam Gate 8 Side seal leak, bottom left side of gate.

10/10/00



Little Goose Dam 10/10/00

8-13

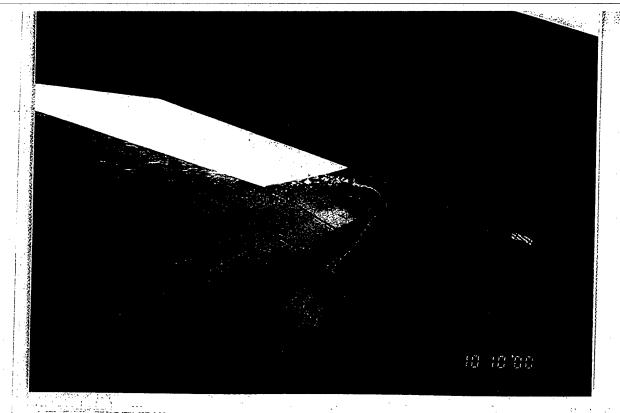
Gate 8
Outside of right frame, typical.



Little Goose Dam

10/10/00

Gate 8
Right frame, middle radial strut, standing water between girder flanges due to drain above (see photo 8-15).



Gate 8
Drain in right pier wall, draining on gate members.

10/10/00

8-15

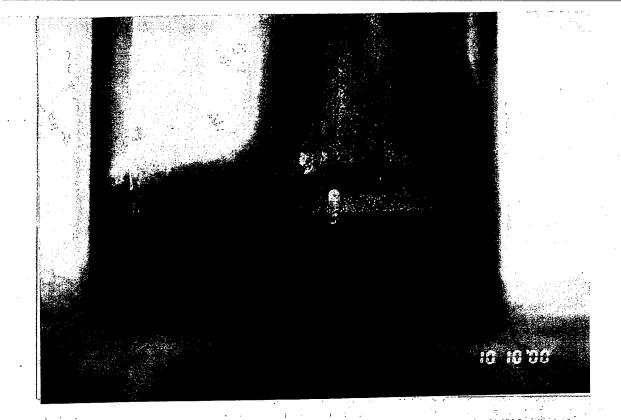


Little Goose

Dam

Gate 8
Typical upstream skin plate condition, heavy concentration of pitting.

10/10/00



Little Goose Dam 10/10/00

8-17

Gate 8
Bottom seal closure plate looking upstream. Standing water between closure plate, purlin webs and skinplate, typical.



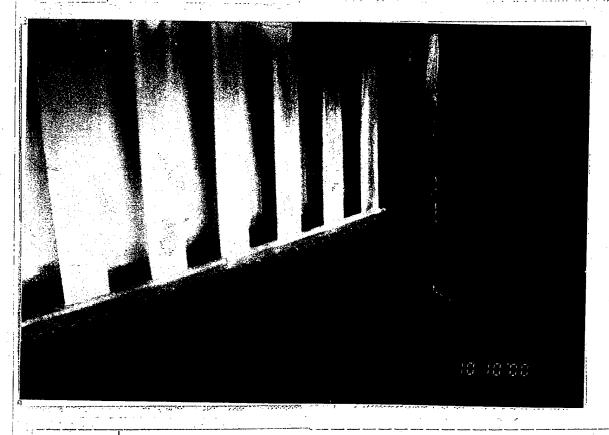
Little Goose Dam Gate 8
Bottom seal keeper plate, typical.

10/10/00



Gate 8
Embedded bottom seal plate. Note: heavy flow due to stop log leakage.

10/10/00 8-19



Little Goose Dam Gate 8
Bottom left corner of gate. Bottom seal closure plate looking upstream. Standing water between closure plate, purlin webs and skinplate, typical.



10/10/00

8-21

Gate 8
Skin plate pitting, typical.

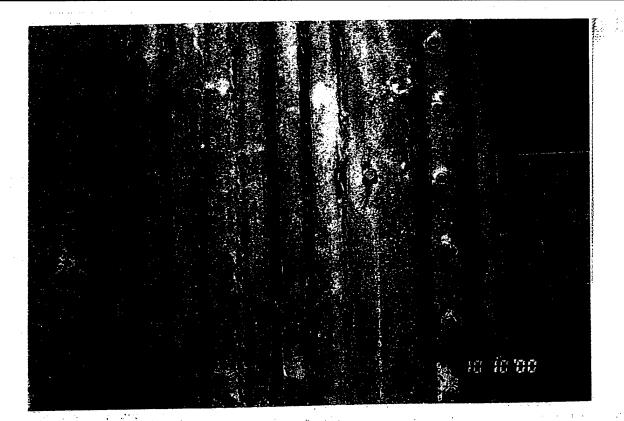


Little Goose Dam

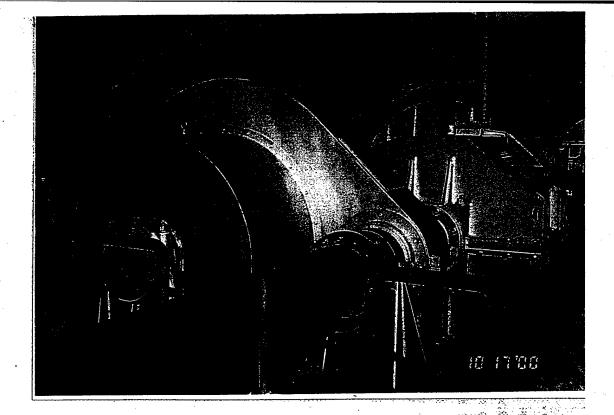
10/10/00

8-22

Gate 8 Skin plate, typical.



Gate 8
Cable wear plate, typical condition.
Light to moderate corrosion, minimal cable wear.



Hoist and Mechanical Hoist, typical.

M-1

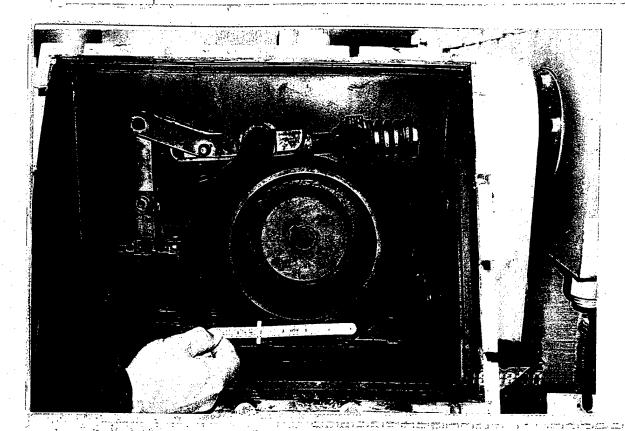


Little Goose Dam Hoist and Mechanical Amperage readings during operational testing, typical.

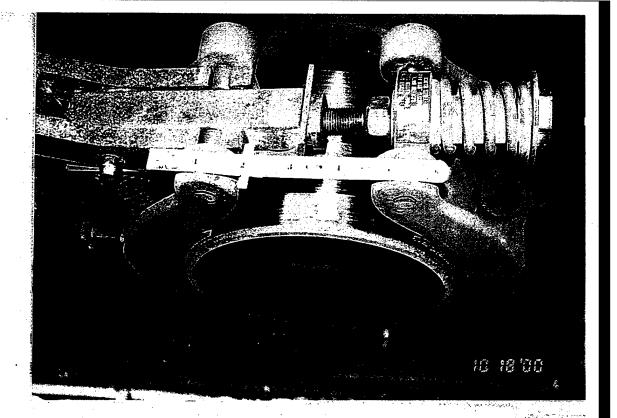


Hoist and Mechanical Amperage readings during operational testing, typical.

M-3



Little Goose Dam Hoist and Mechanical Seized motor brake on Gate 6 during operational testing.



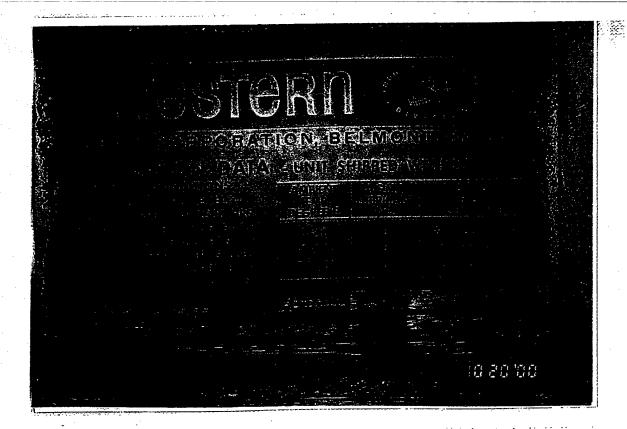
Hoist and Mechanical Seized motor brake on Gate 6 during operational testing.

M-5



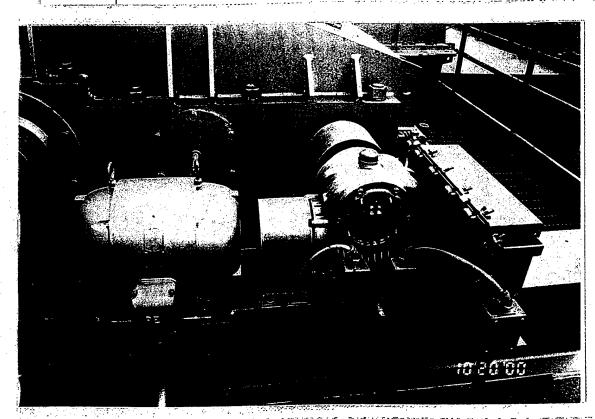
Little Goose Dam Hoist and Mechanical Hoist, typical.

M-6

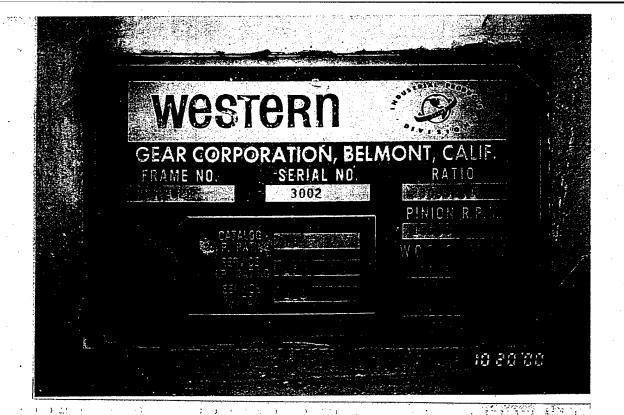


Hoist and Mechanical Hoist, name plate, typical.

M-7

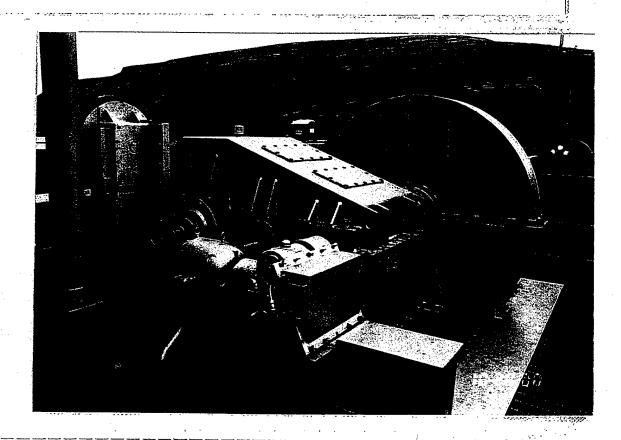


Little Goose Dam Hoist and Mechanical Hoist, typical.



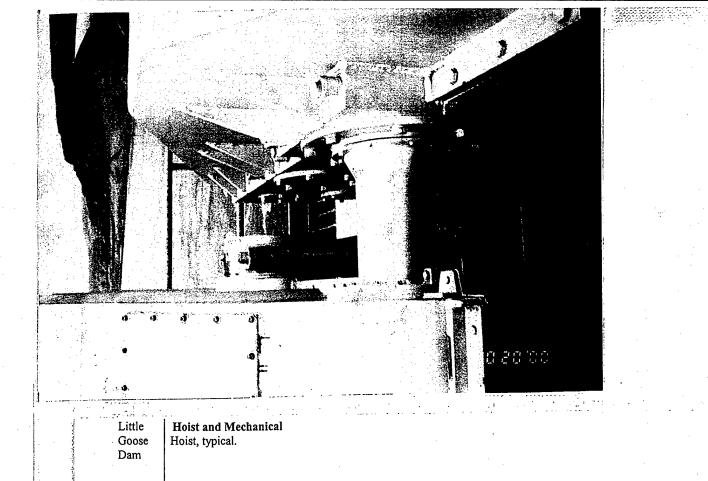
Hoist and Mechanical Hoist, name plate, typical.

M-9

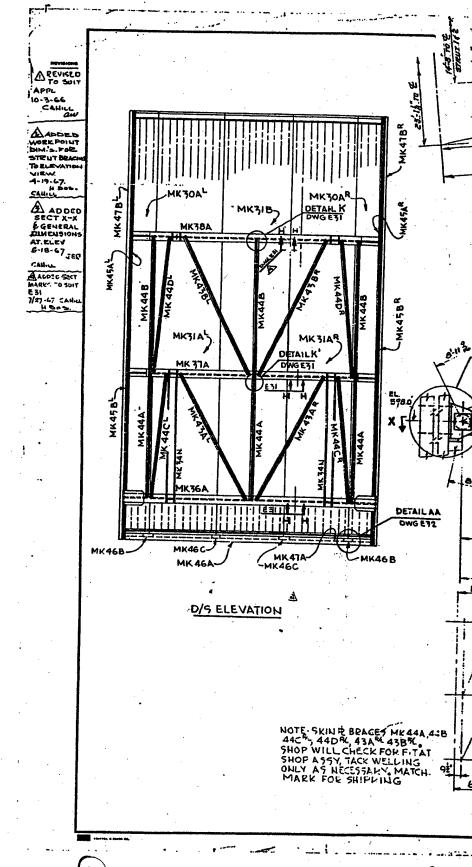


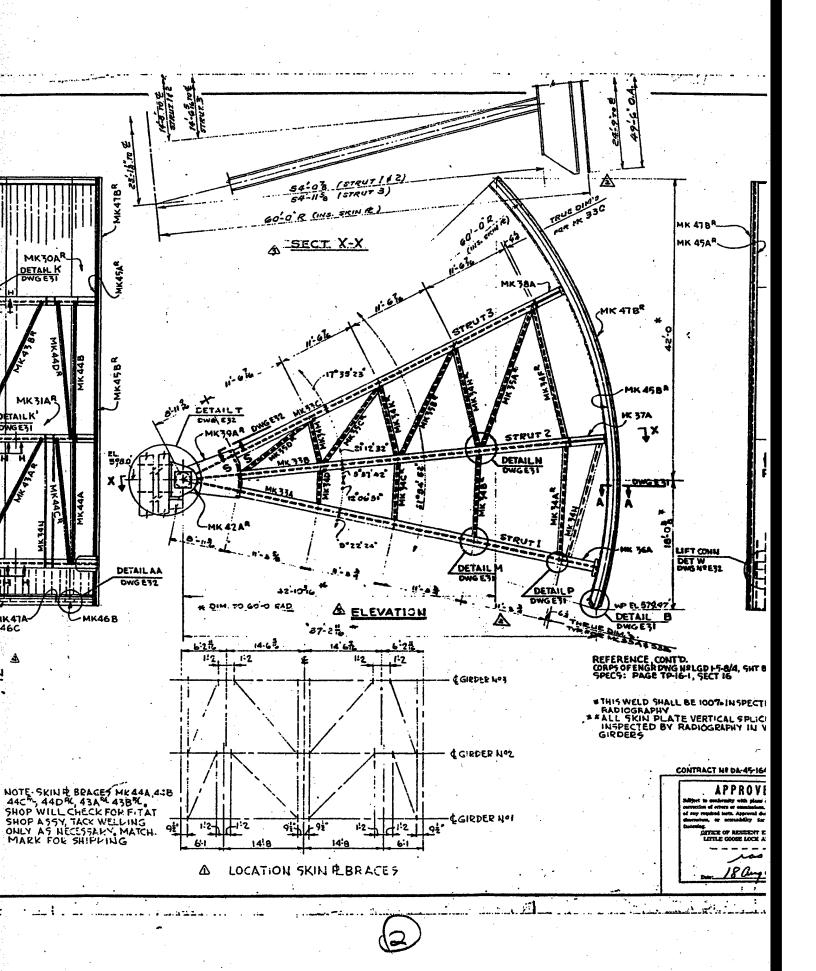
Little Goose Dam Hoist and Mechanical Hoist, typical.

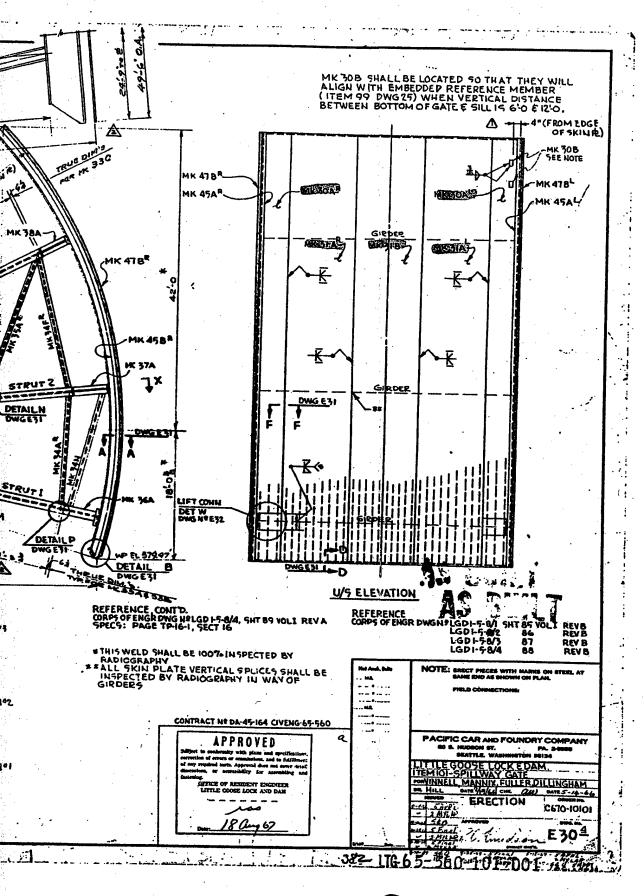
M-10



M-11





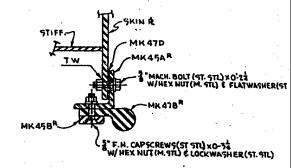


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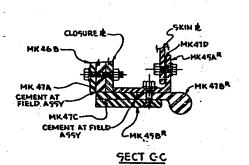
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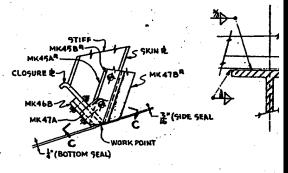
7/27/67 CAH



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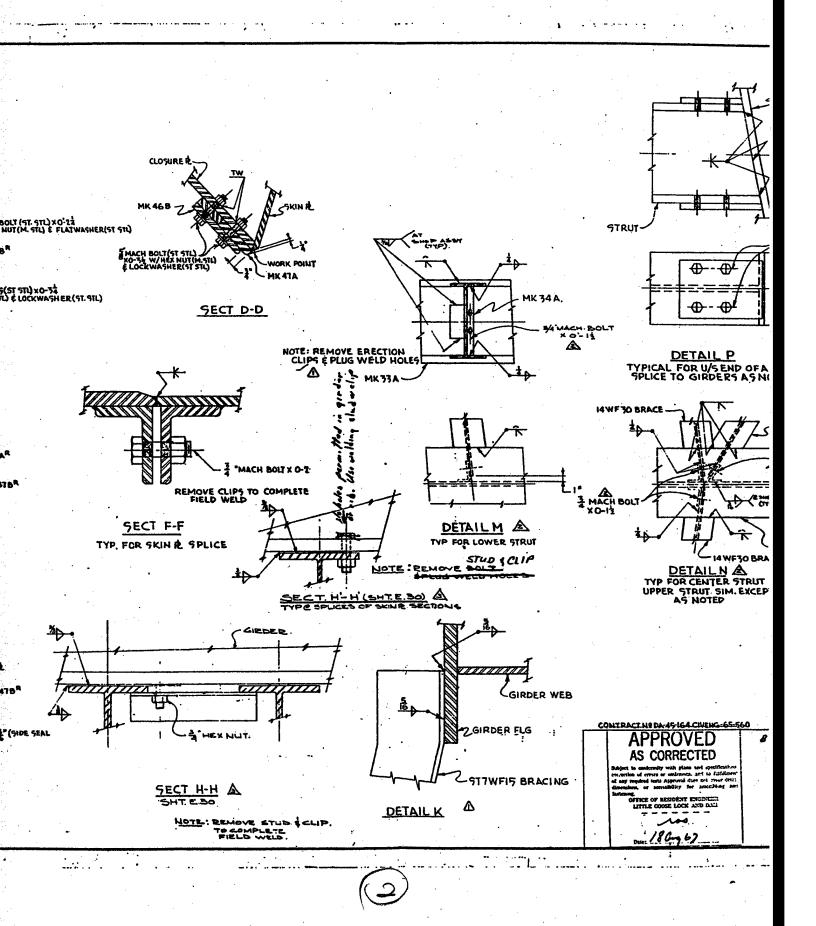


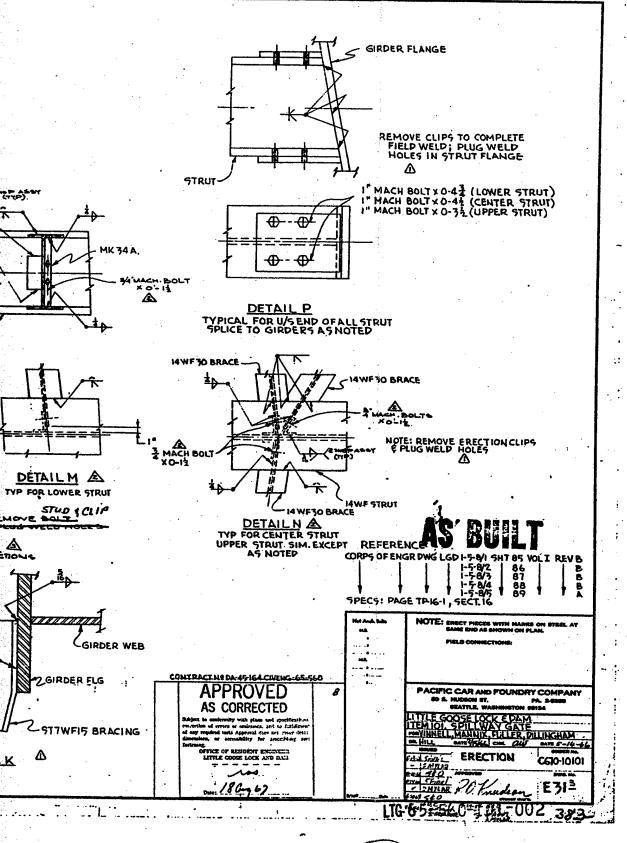
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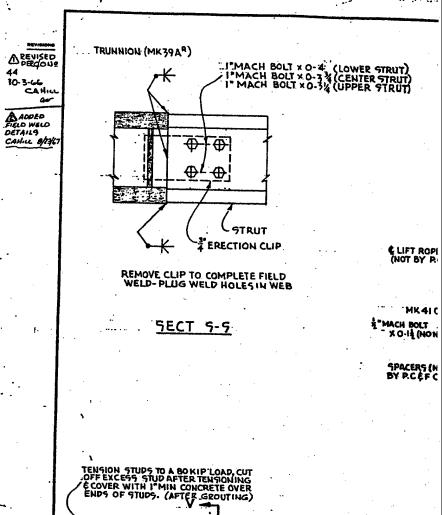


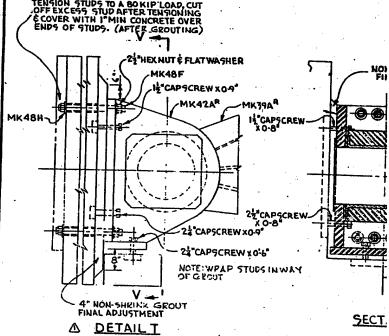
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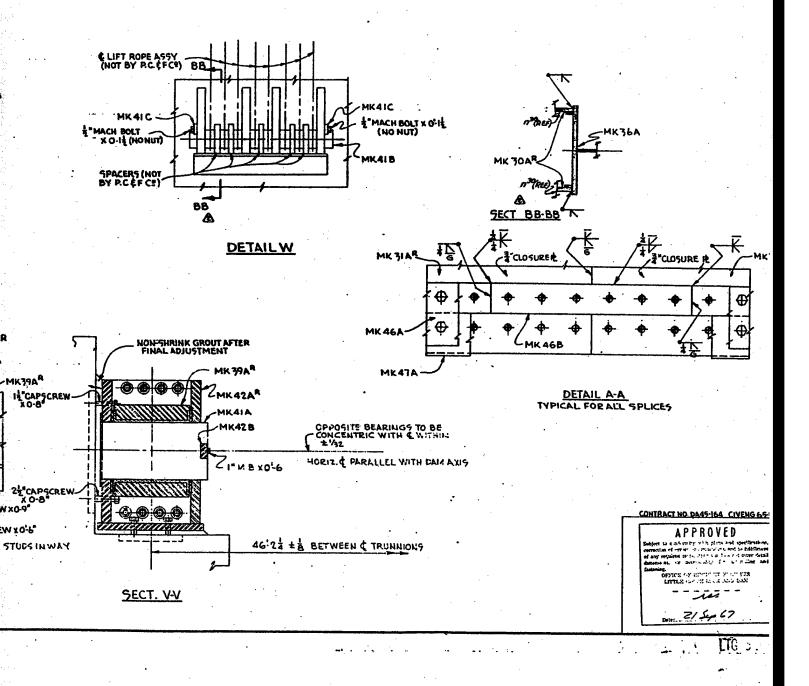


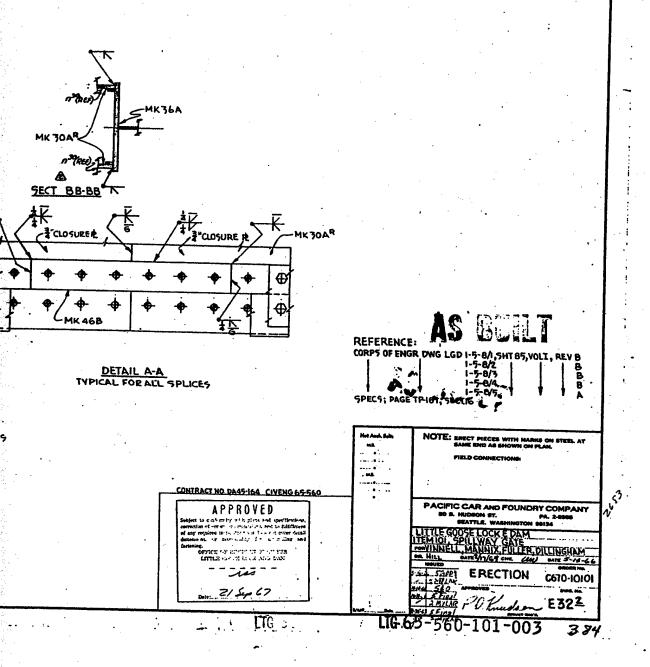


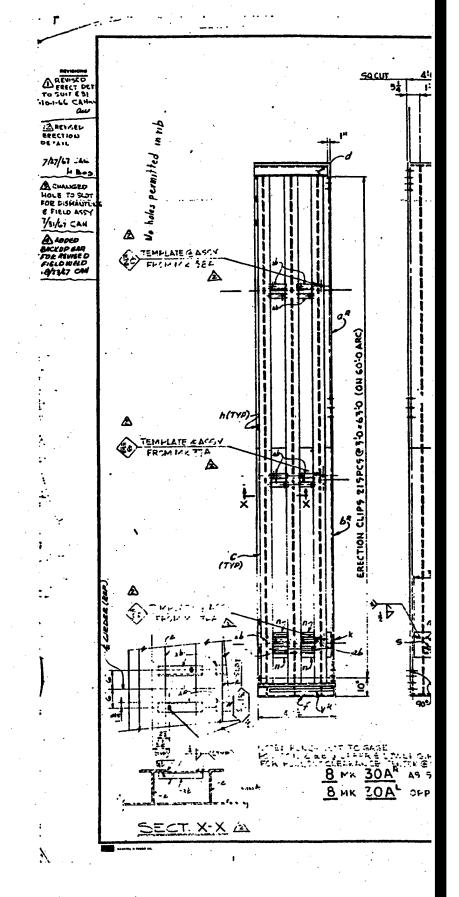


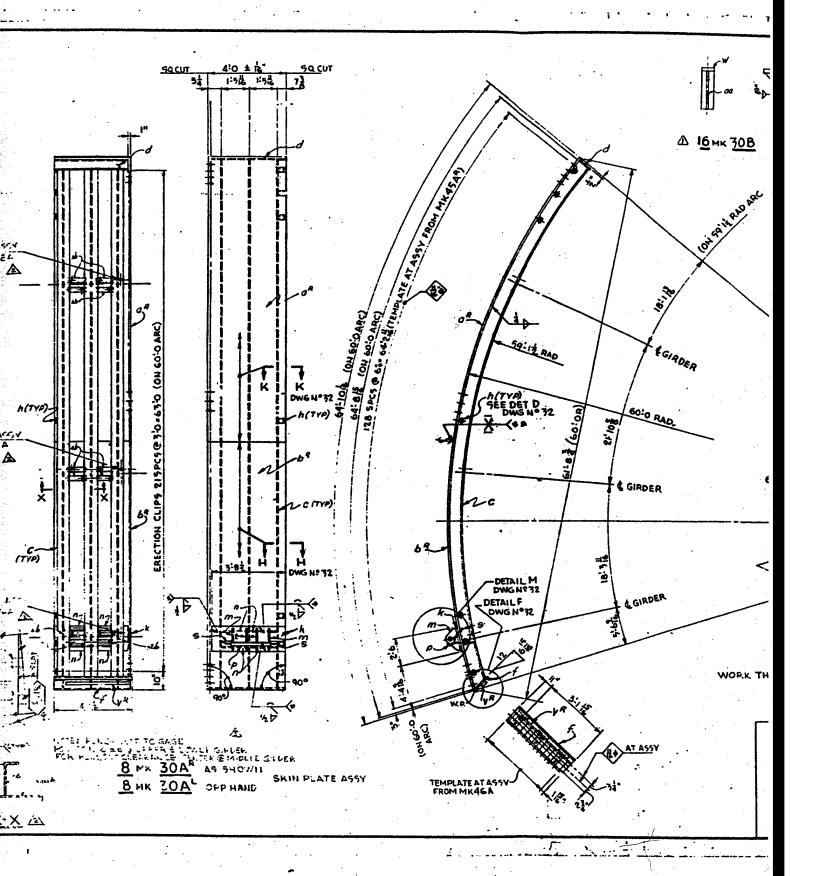




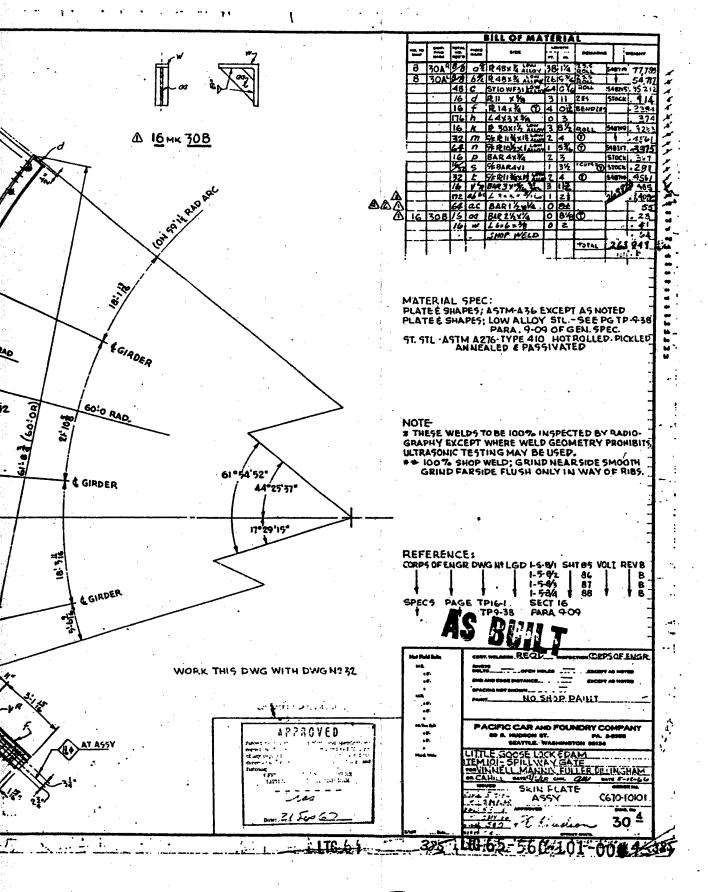


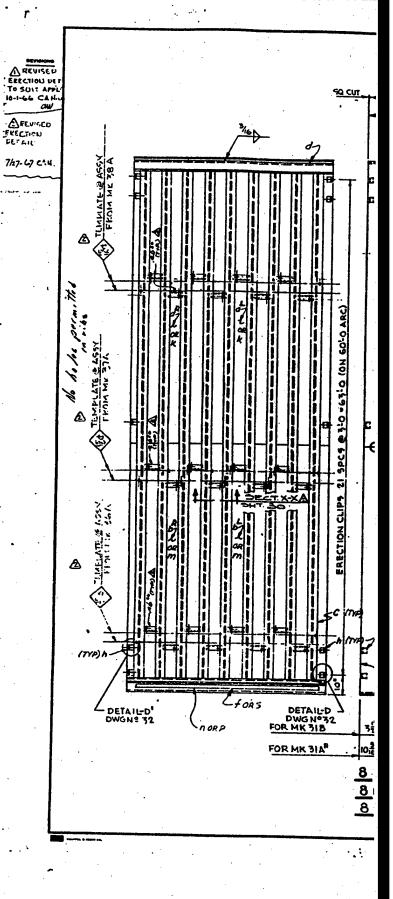


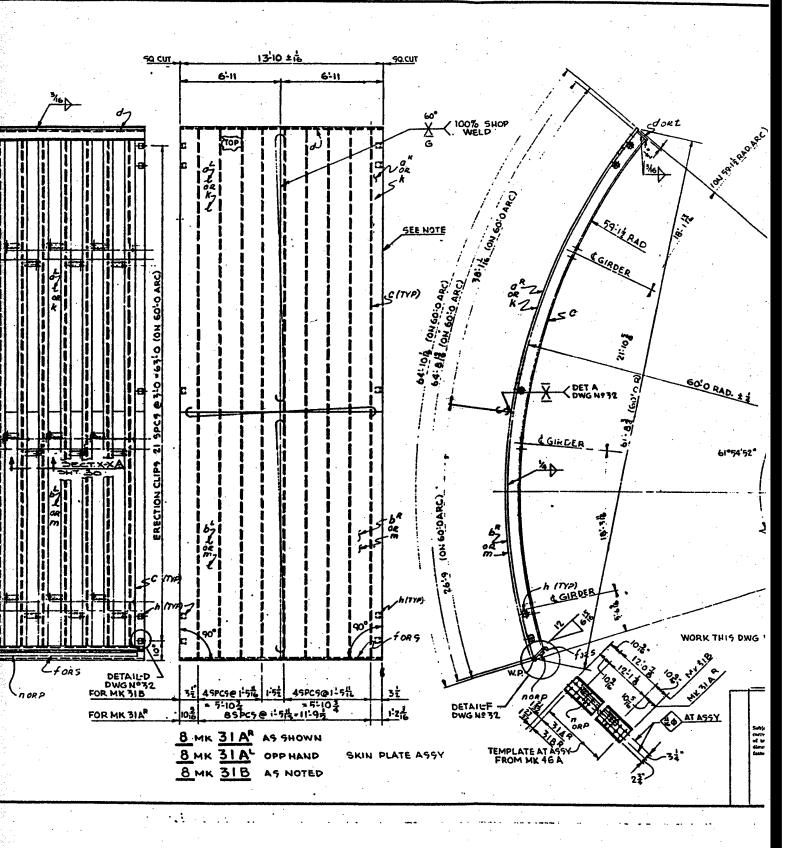


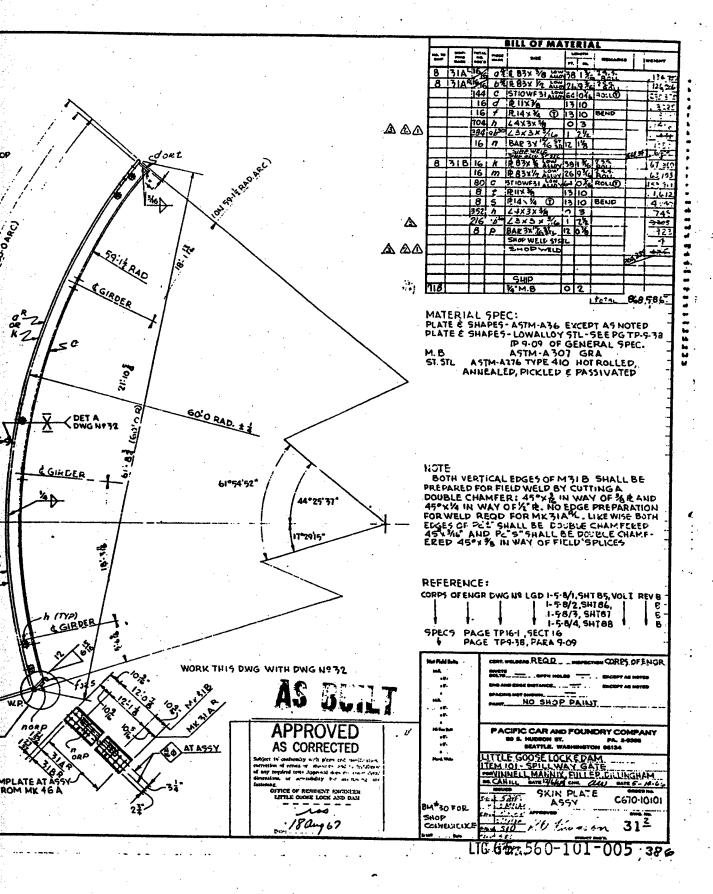


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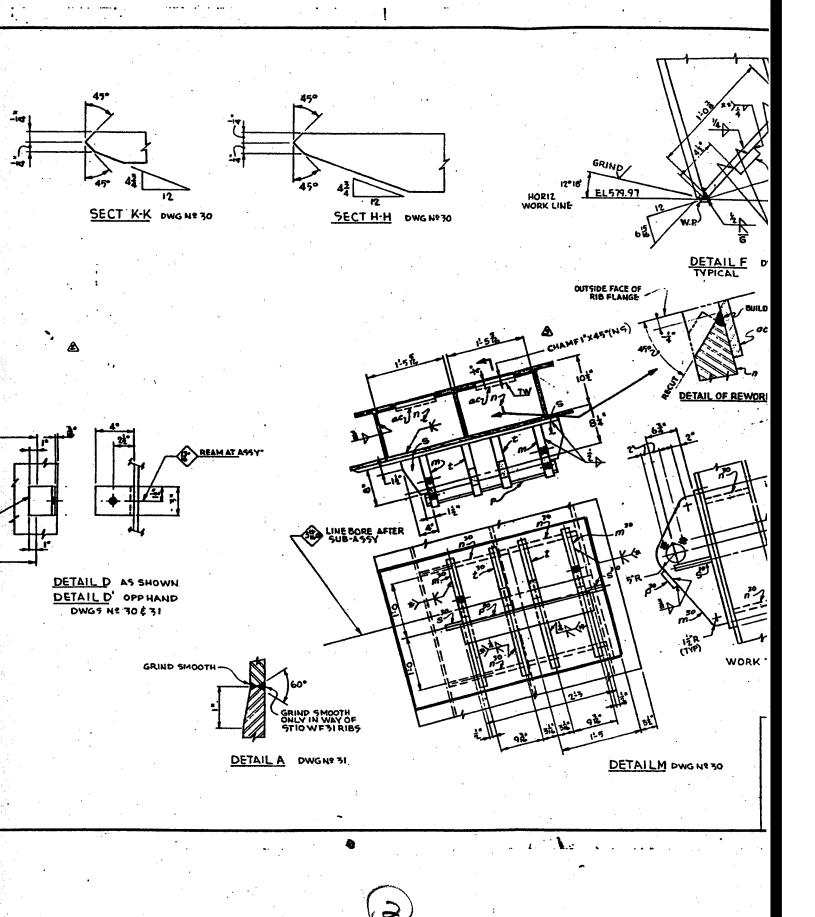


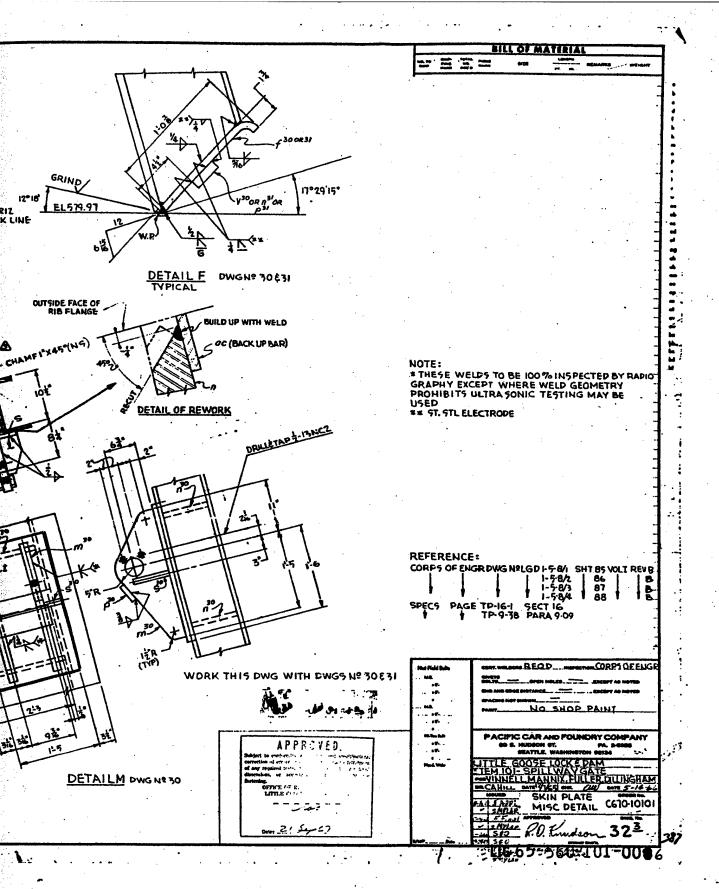






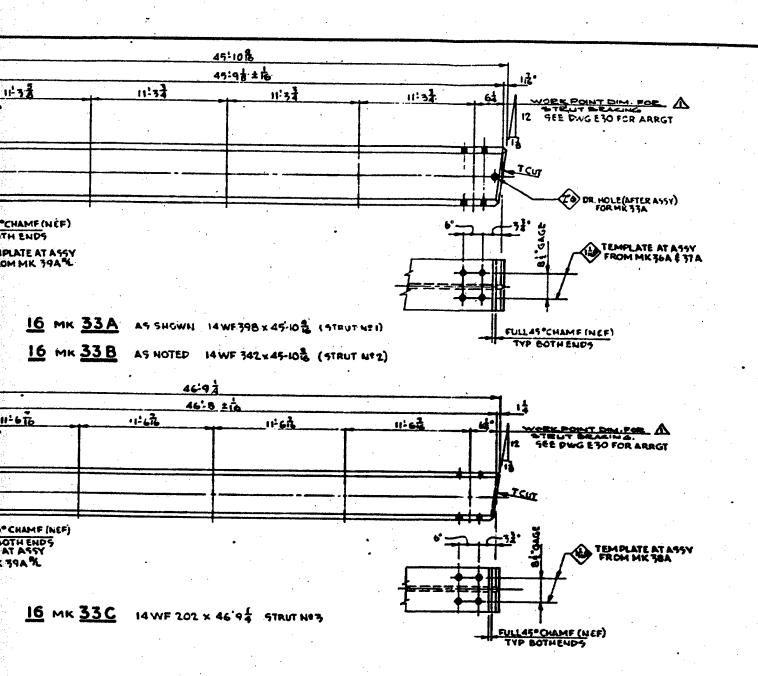
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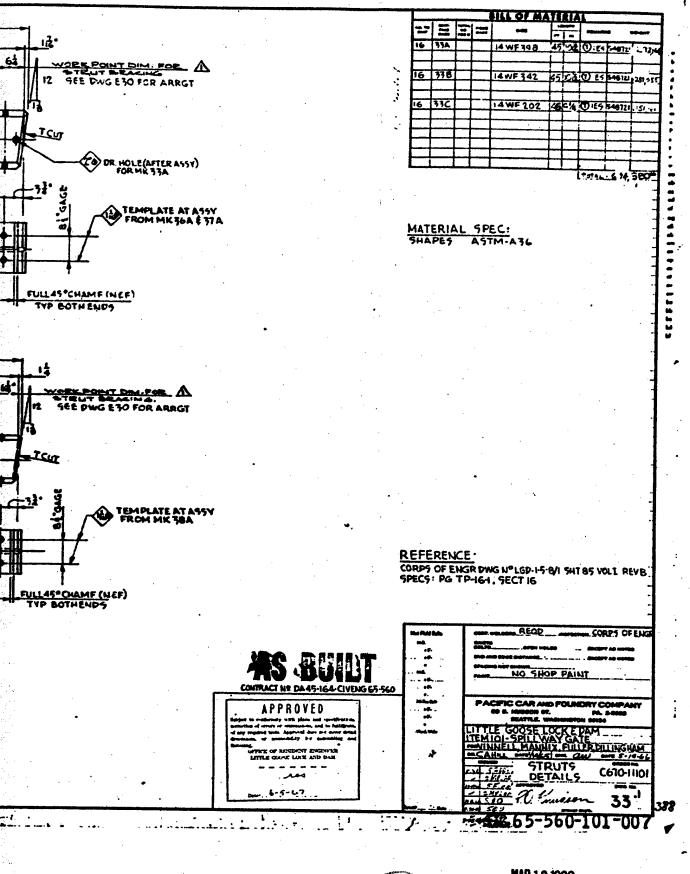
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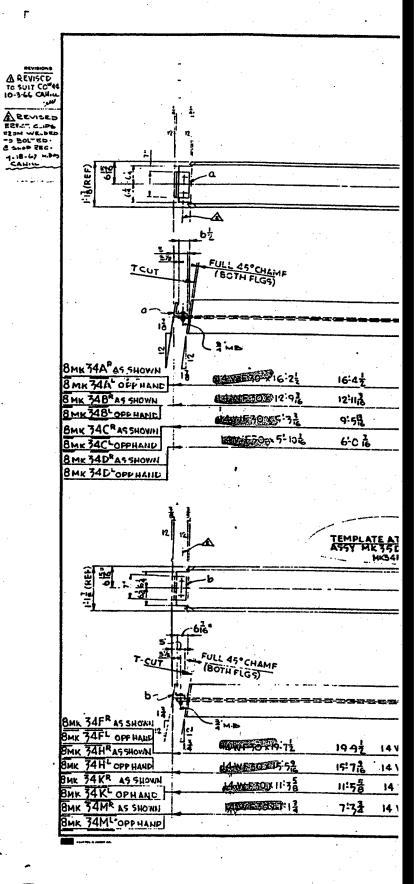
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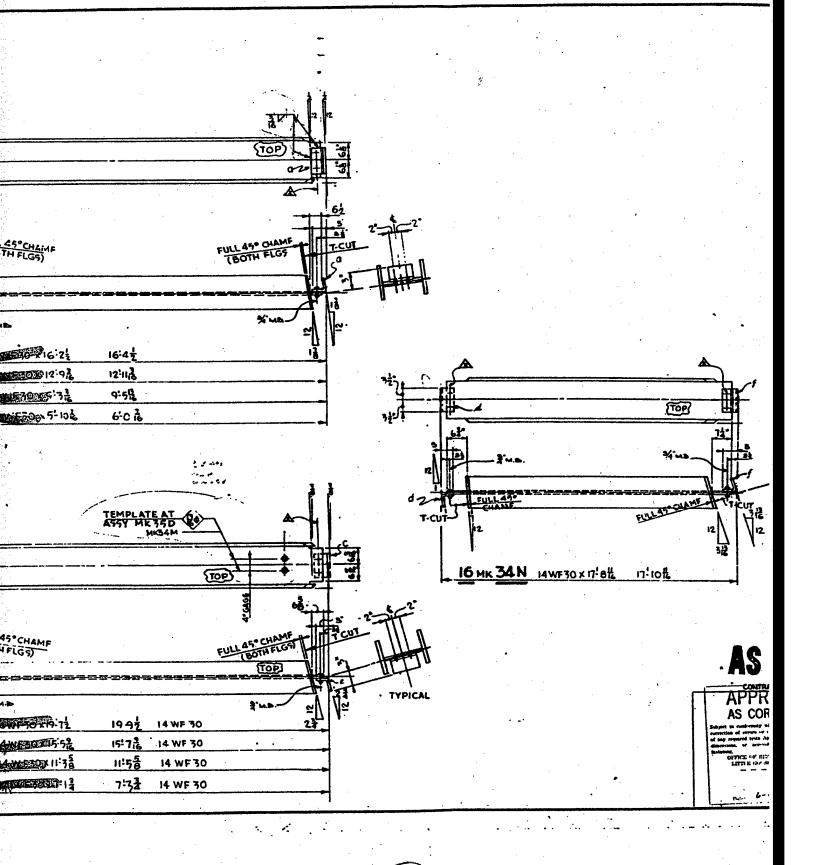
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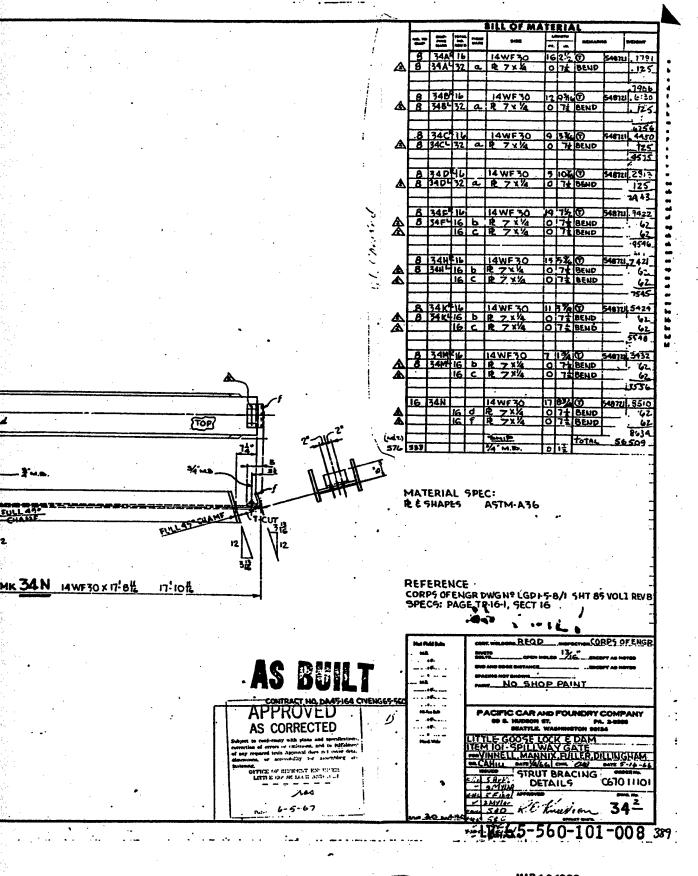
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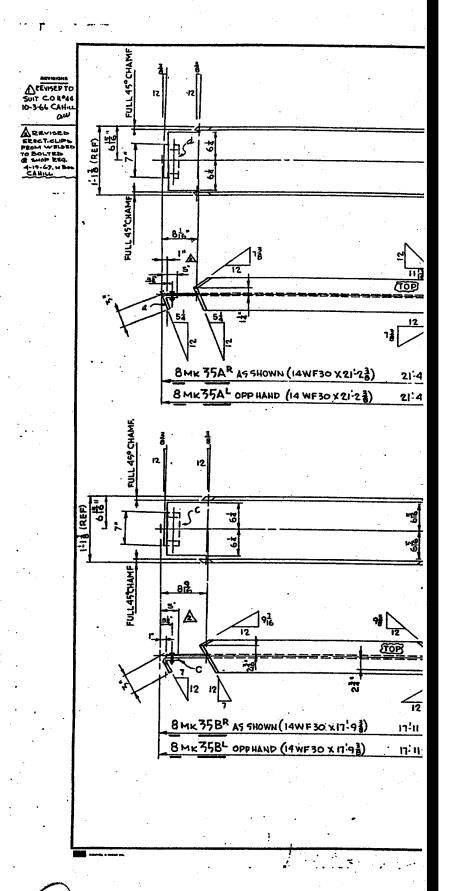


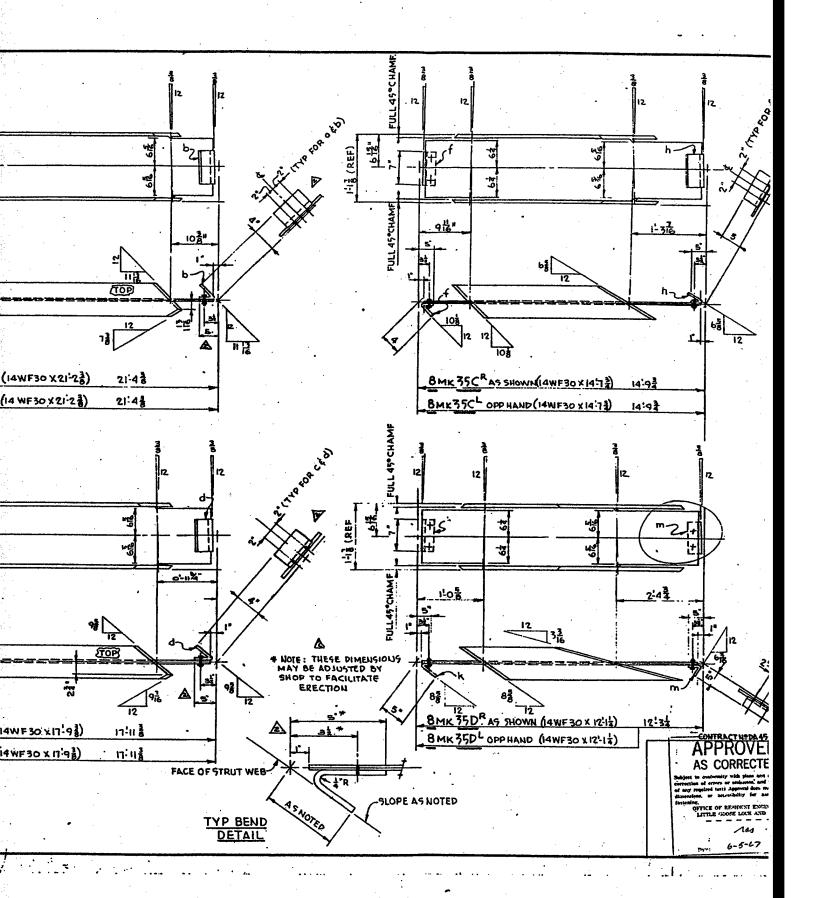


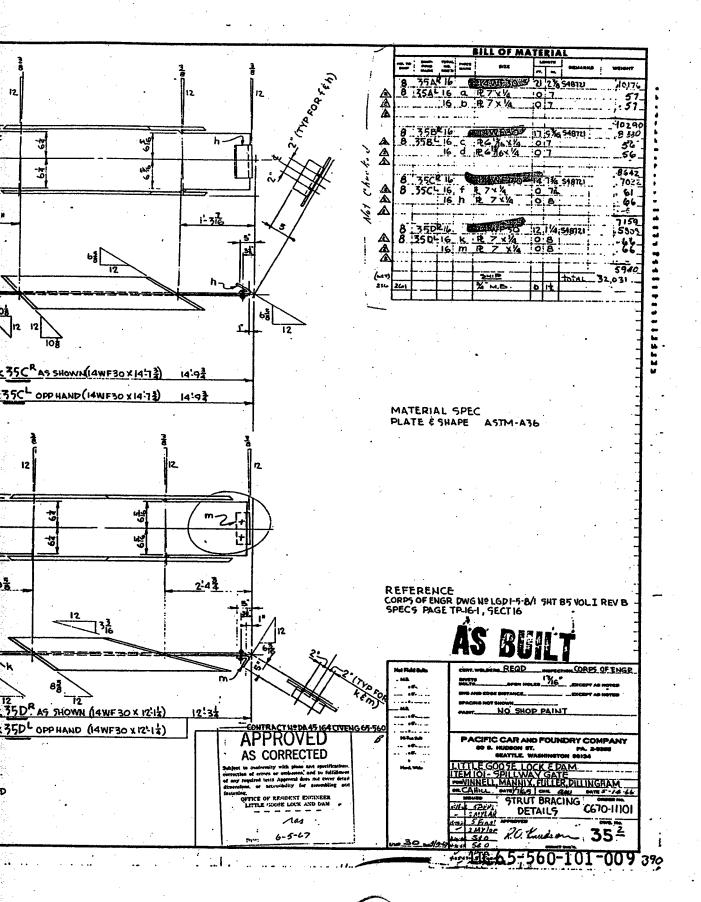


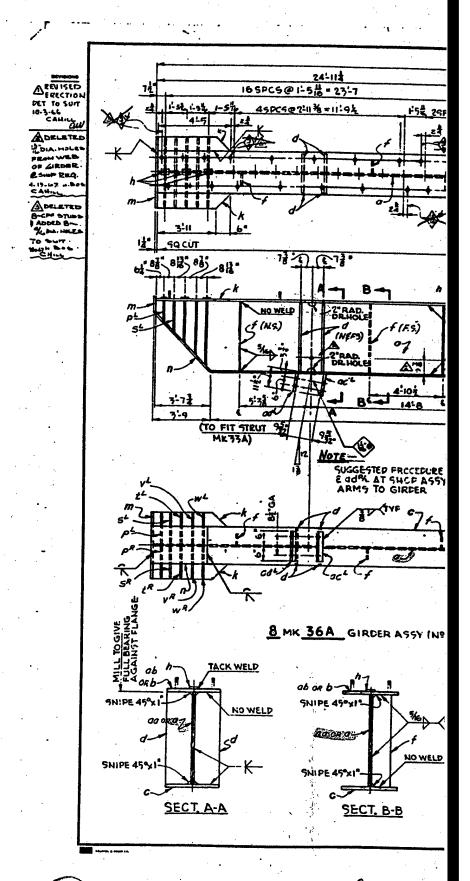


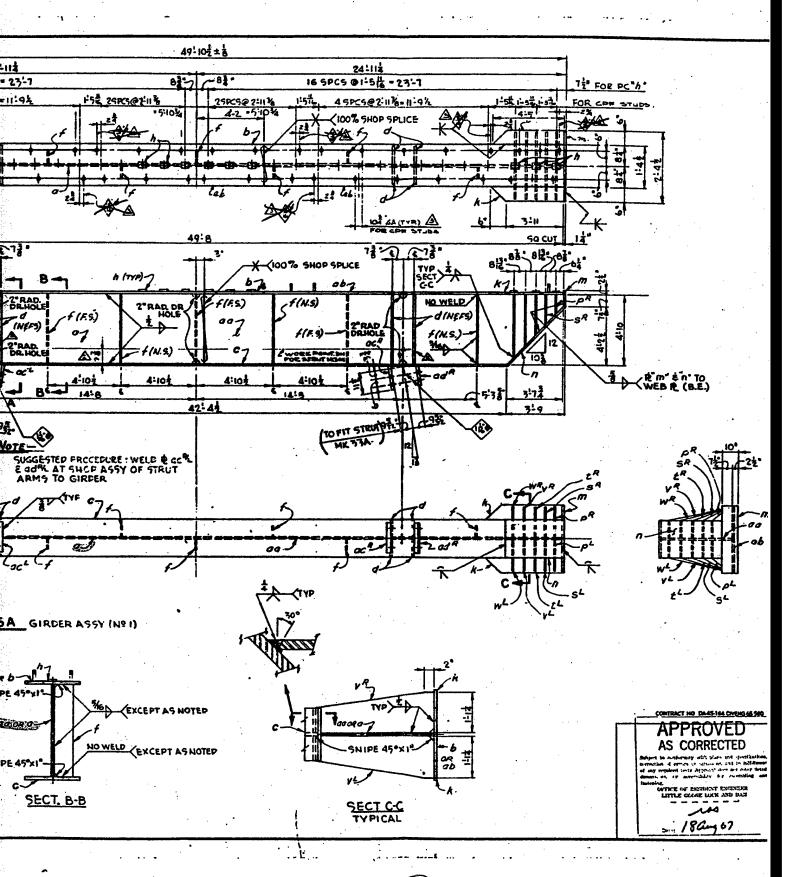
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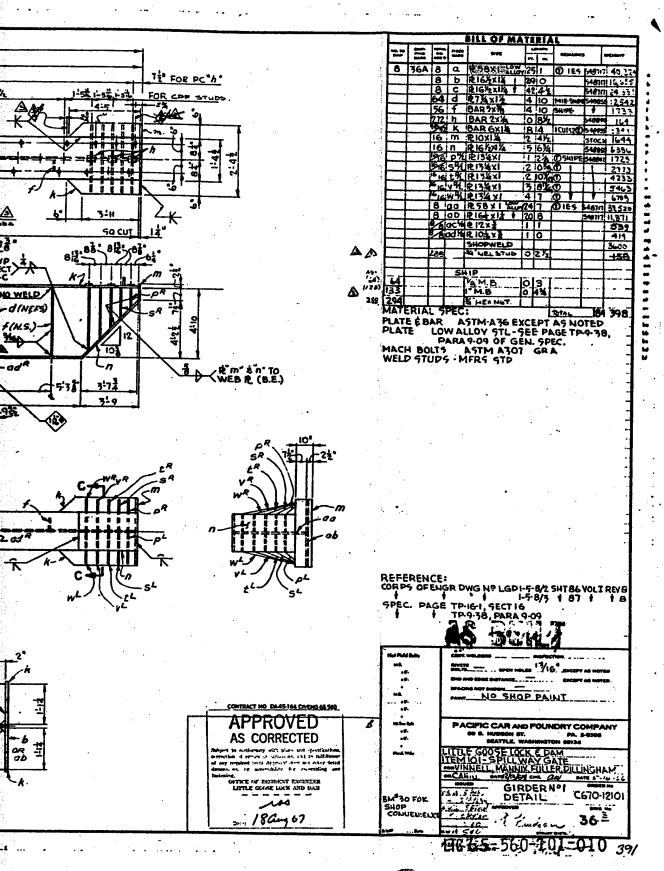


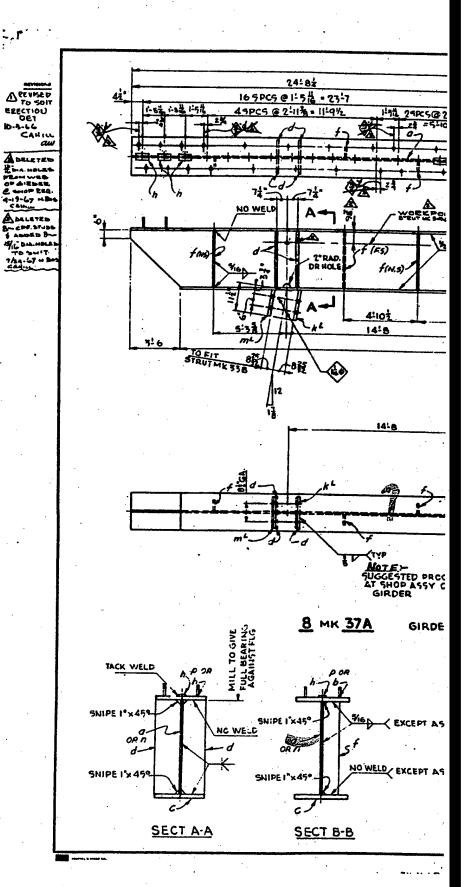


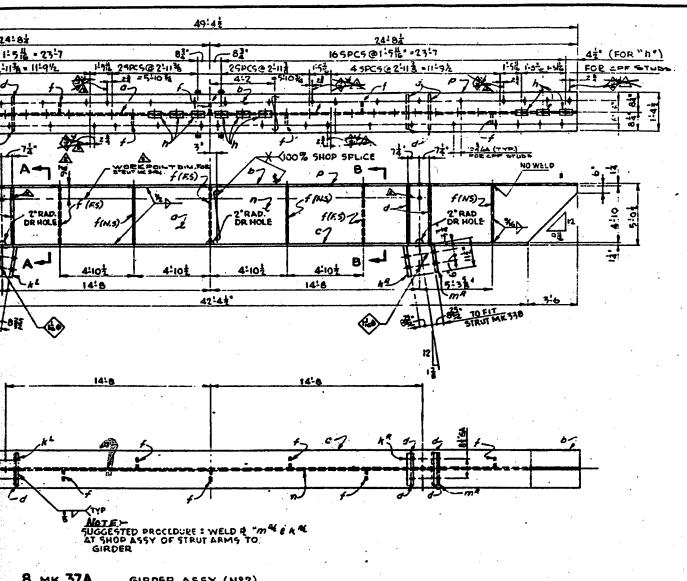




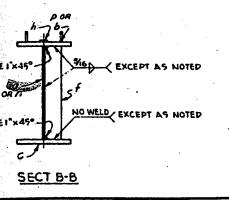








8 MK 37A GIRDER ASSY (Nº2)

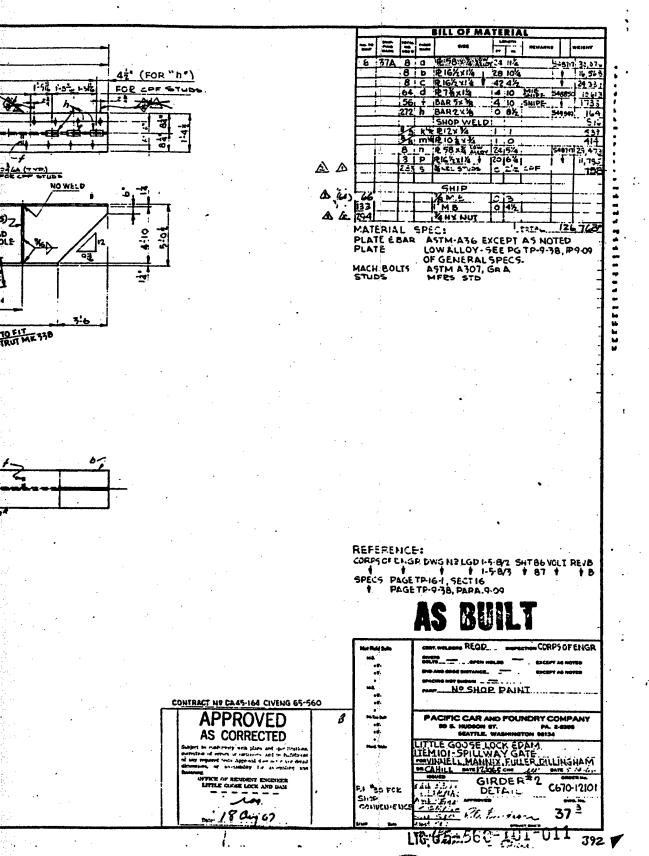


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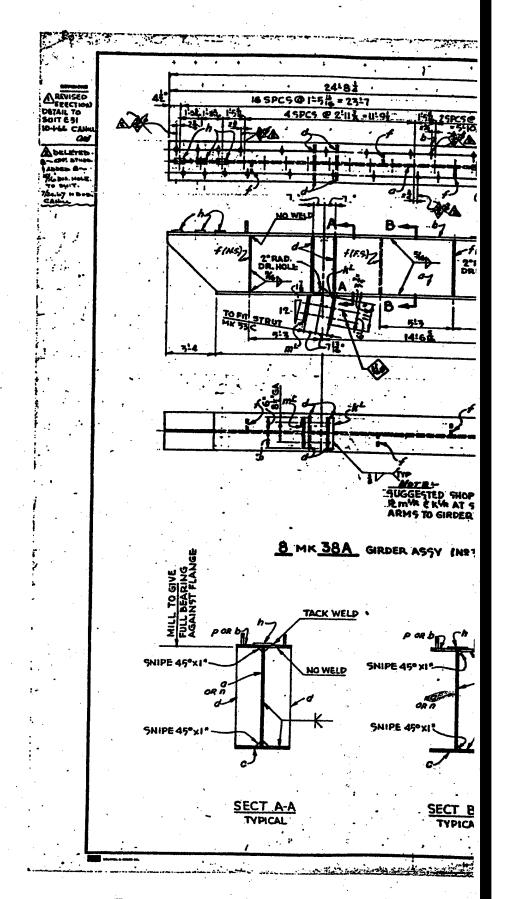
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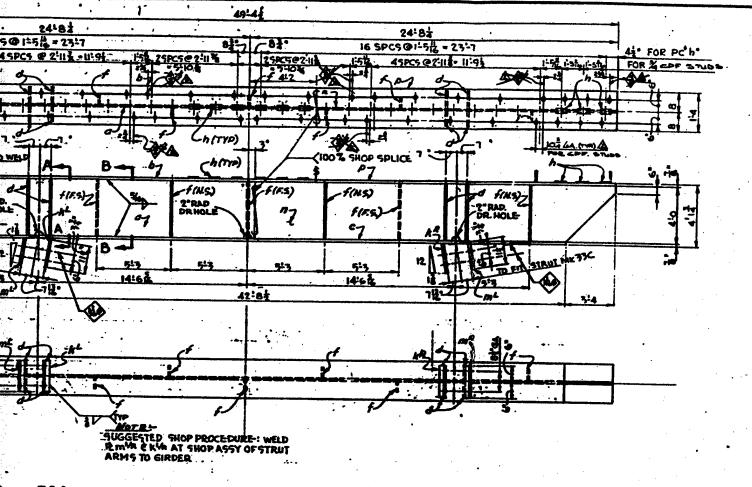
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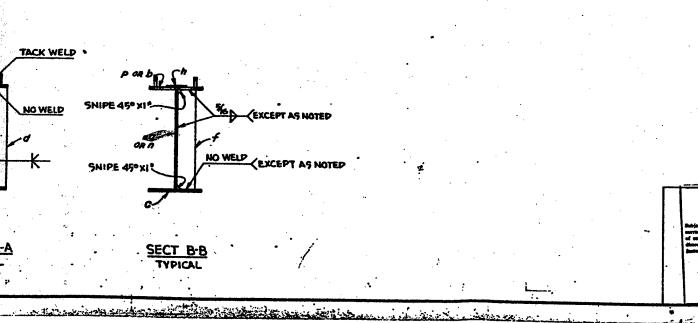


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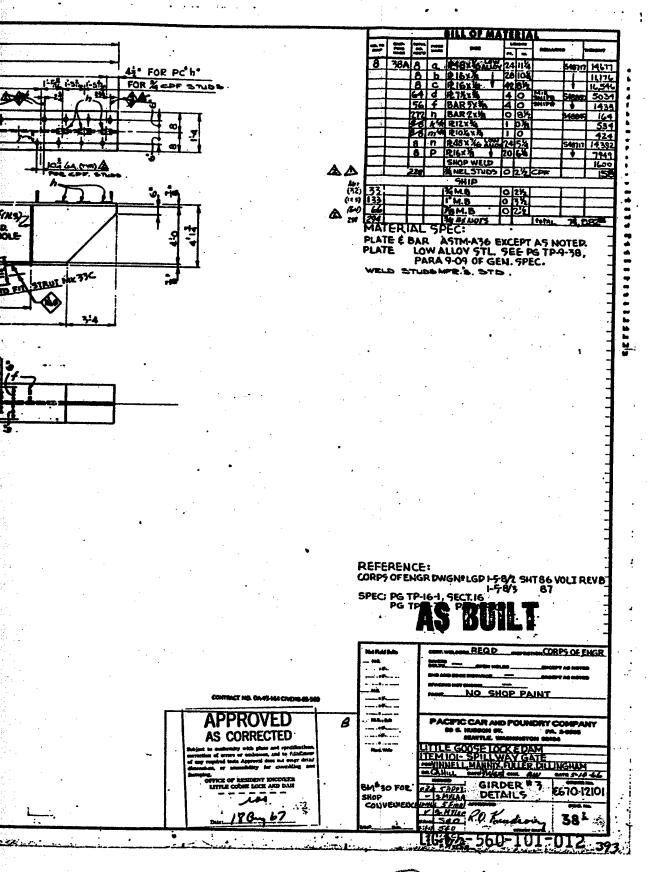


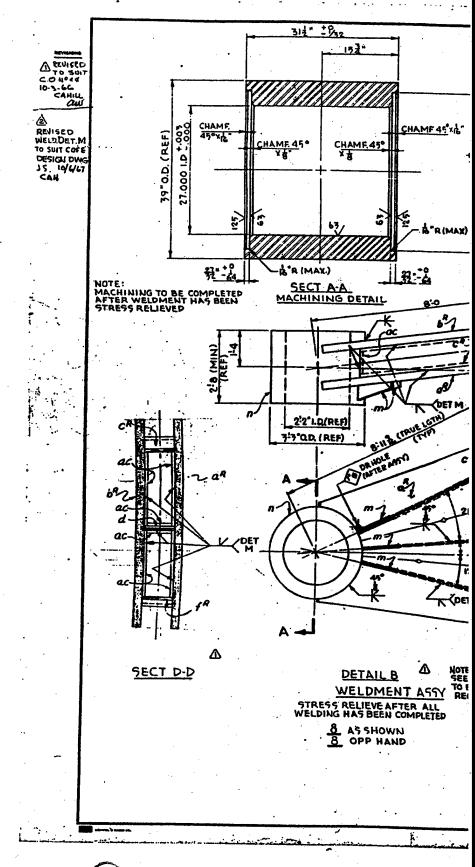
MK 38A GIRDER ASSY (Nº3)

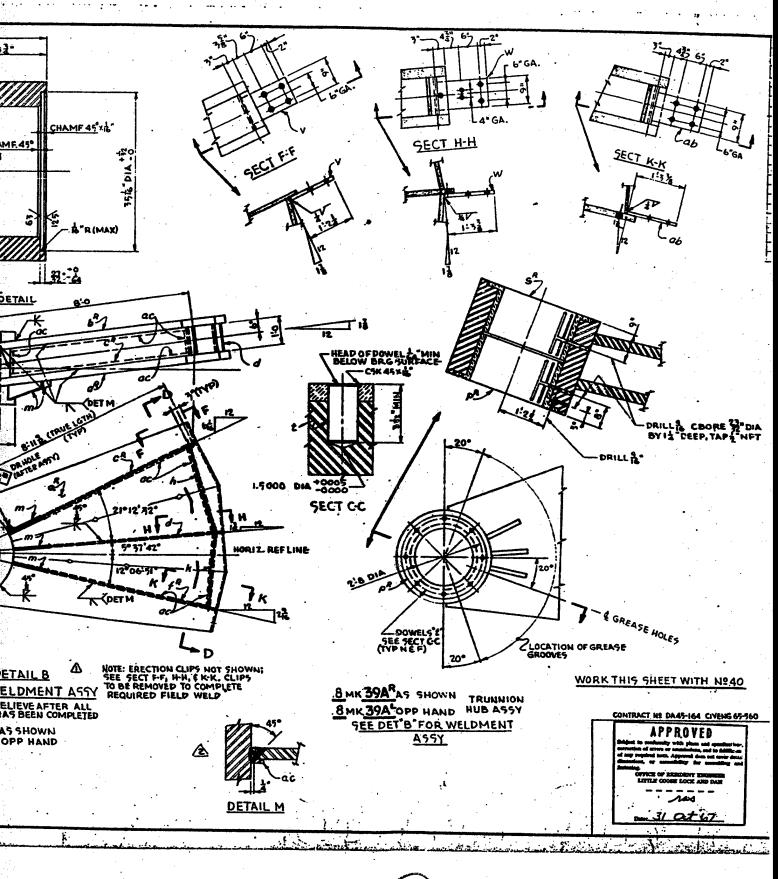


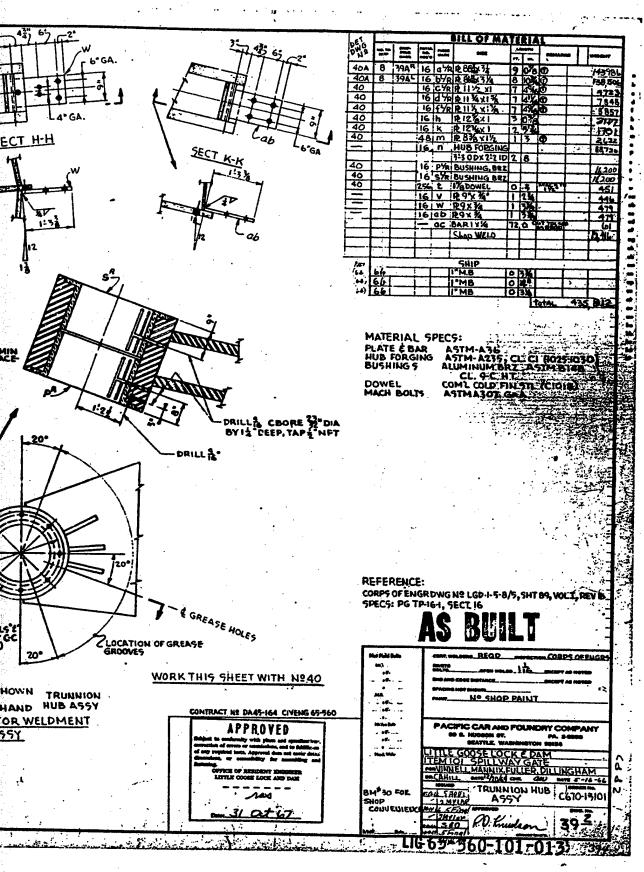
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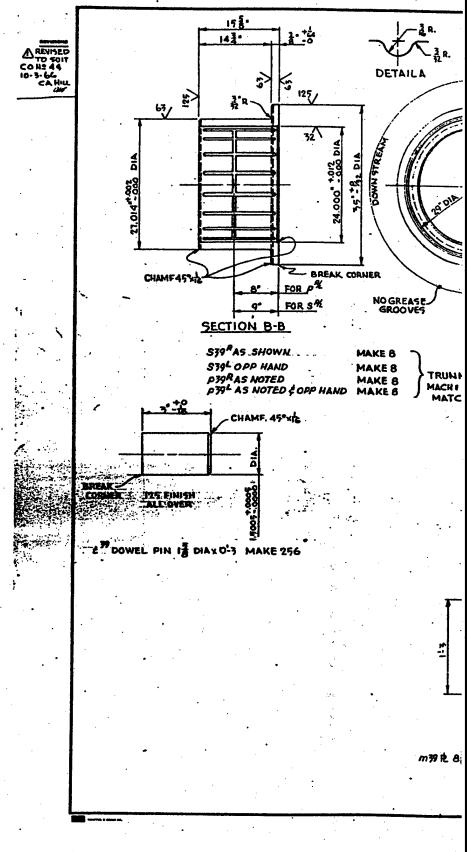




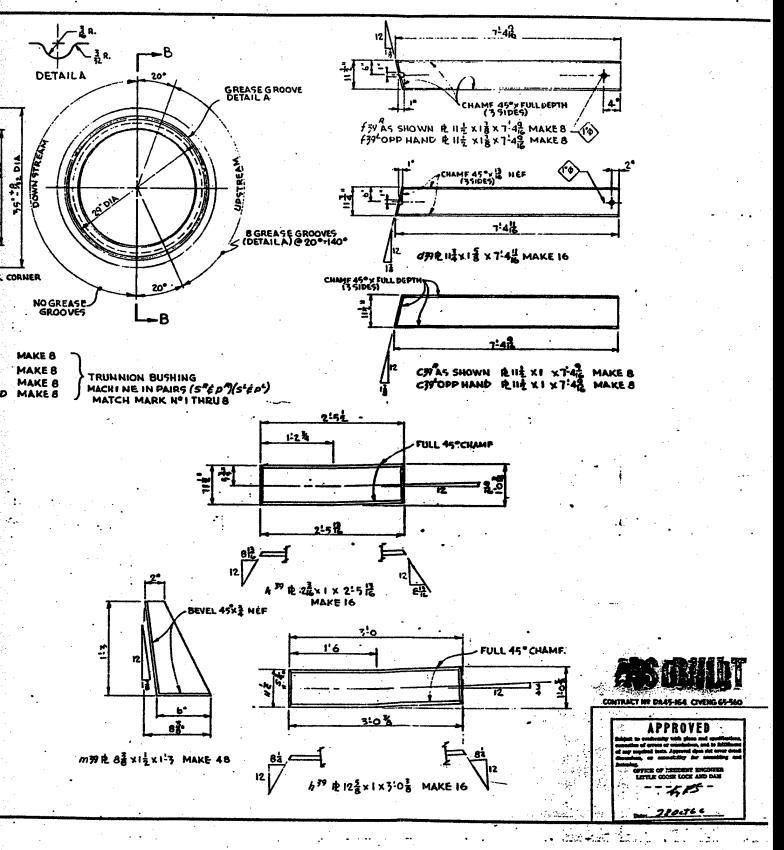


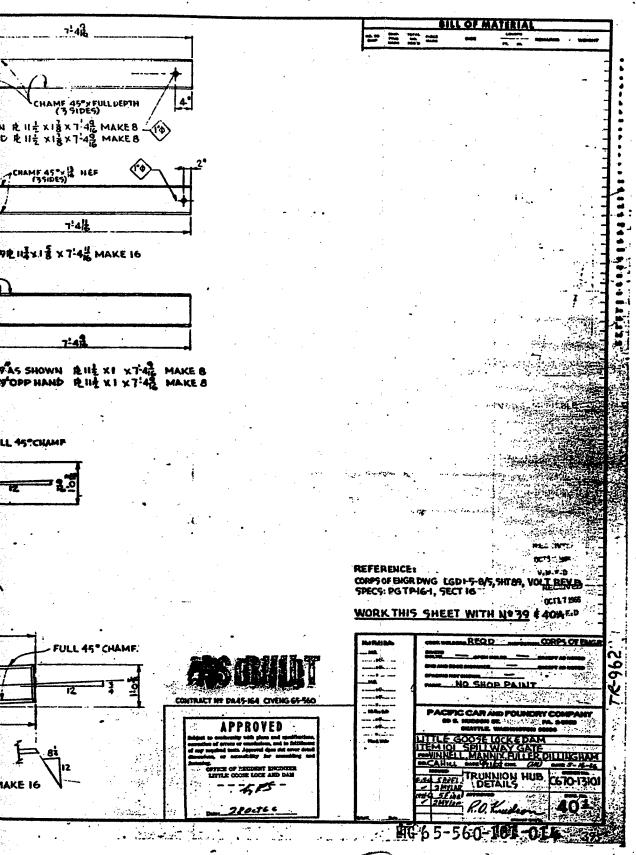




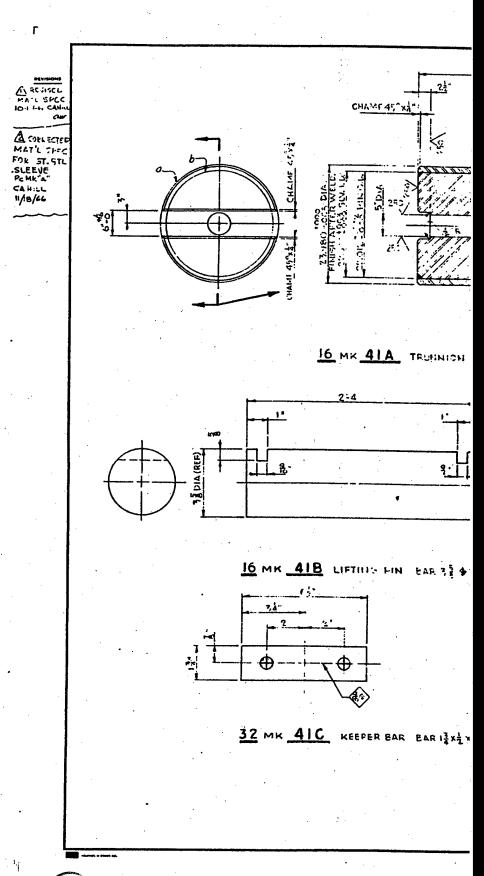


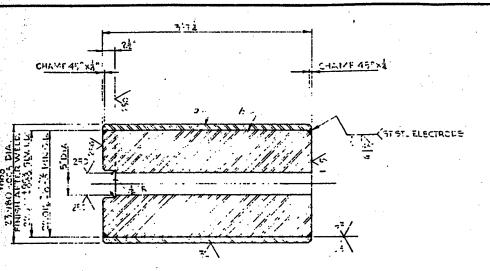
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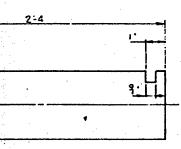


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16 MK 41A TRUNNION PIN



B LIFTING HIN EAR 3 \$ 4 x 24



C KEEPER BAR BAR 13x2x0-62



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MATERIAL SPECS:

FORGING ASTM A 237 CL.C ST STL(LIFTPH) A STM A 276 TYPE 410 CONDT ST STL (KEEPER BAR) ASTMA276 TYPE 3C3 CONDA.

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ST STL CAP SCREW ASTM AZIG TYPE 410
ST STL LOCKWASHER COM'L STD
ST STL SLEEVE (PERM'AT) CENTRIFUGAL CAST
STAINLESS STEEL MAINUFACTURED IN ACCORDANCE
WITH ASTM ASSI GEADE CFE ANNEALED WITH
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PEFERENCE: CORPS OF ENGR DWG Nº LGD 1-5-8/2 SHT 36 VCL 1 REV B SPECS PG TP-16-1 , SECT 16

CONTRACTIVE DAME-164-CIVERG-65-56
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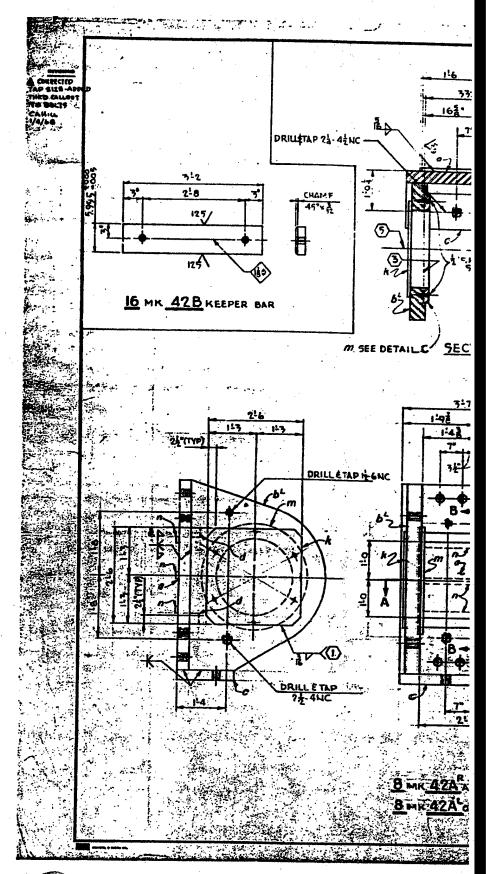
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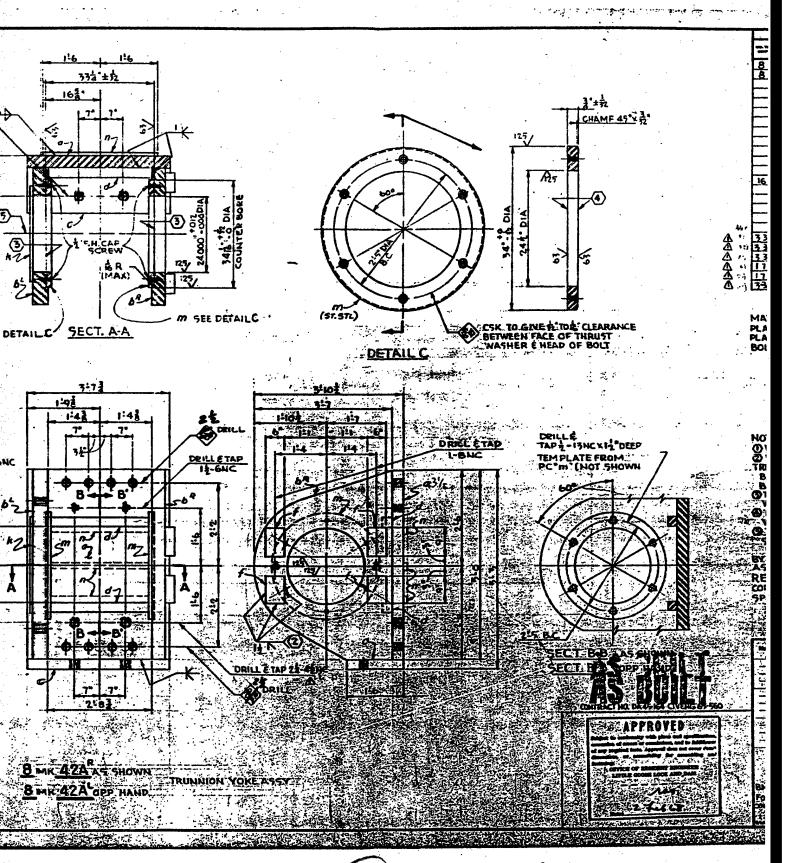
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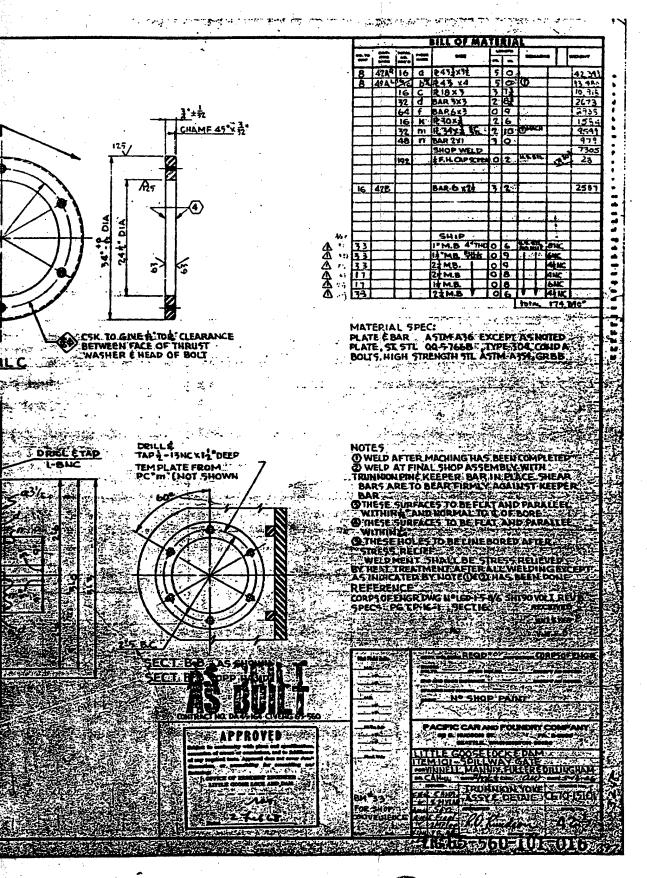
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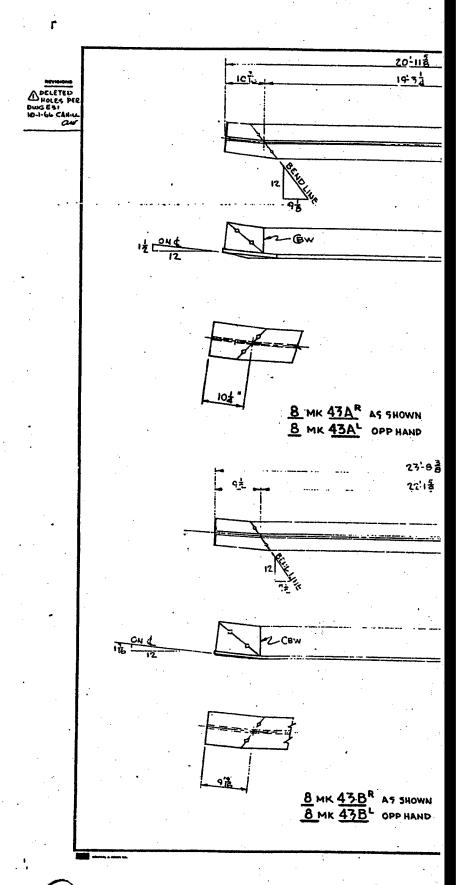
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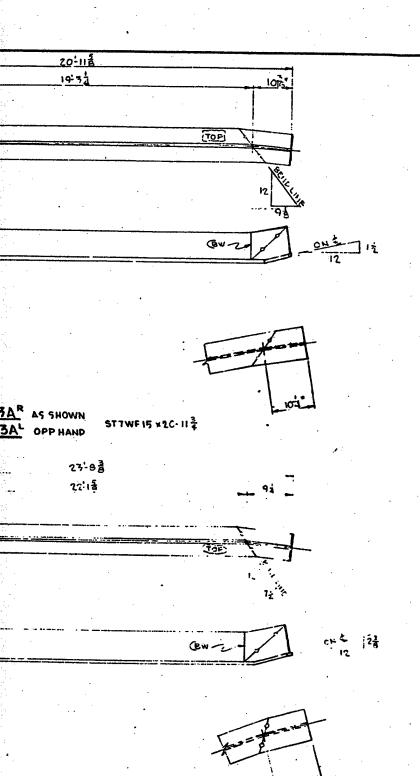
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MATERIAL SPEC: SHAPES ASTM-A36

REFERENCE:
CORPS OF ENGROWG Nº LEDI-5-8/3 SHT 87 VOLT REV B
SPEC5: PAGE TP16-1, SECT 16

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